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DEPARTMENT OF AGRICULTURE

Twentieth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi for the 1953/54 Season

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Twentieth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi for the 1953/54 Season

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COFFEE RESEARCH AND EXPERIMENTAL STATION, LYAMUNGU, MOSHI

Report for the 1953/54 Season

General

The 1953 crop amounted to 64·22 tons of clean coffee. This is an average of 10·13 cwt. of clean coffee per acre. The average yield per acre over the past six years has been 8·95 cwt.

Of the coffee sent to the mills, 18·1 per cent was classified as 3, 39·1 per cent as 4, and 15·4 per cent as 5. The out-turn figure, *debes* of cherry per ton of parchment, was 418; the corresponding figure for the 1952 crop was 370.

The heavy demand for seed continued during the year. Five thousand nine hundred pounds of seed was sold to growers.

The period July, 1952 to March, 1953 was one of ineffective rainfall, and the long rains of April to June, 1953, amounting to 29·74 inches, ceased abruptly at the end of the first week in June. Hot, sunny periods occurred after the cessation of these rains. During the last quarter of 1953 there were alternating periods of rain and hot sun.

The prevailing weather conditions made it necessary to irrigate the young coffee in Experiments IIIB (Clones *v.* Seedlings), XVIIIA (Clonal Selection Trials) and XXI (Methods of Pruning) in December, 1952, and again in February, June, and August, 1953. Experiment XX (Time of Pruning) was irrigated in February and Experiment XVIII (Clonal Selection Trials) in February and August.

Where irrigation was applied in December, 1952 or in February, 1953, it brought out a heavy flowering; but in those areas where this was not done the coffee did not flower until the rains of late March and early April. Although these rains induced a heavy flowering, the degree of set was relatively poor, and there was also some dropping of the newly-formed cherry. The poor setting and the subsequent fruit drop occurred, presumably, as a result of the heavy rain at the time the flowers opened and immediately afterwards. In one area (Experiment II) probably more than half the flowering failed to set and mature.

In the experiments which were irrigated very high yields were obtained. The area occupied by Experiment XVIII (Clonal Selection Trials) yielded at the rate of 21·73 cwt. of clean coffee per acre. In Experiments IIIB, XVIIIA and XXI, all of which were planted with one year old material in April, 1951, the overall average yield was 6·36 cwt. per acre. Experiment IIIB yielded 8·26 cwt. per acre.

The high yields in all these experiments cannot, however, be attributed entirely to the effects of the irrigations applied between December, 1952 and March, 1953; these only created the necessary conditions to permit

heavy flowerings, and to ensure setting. The persistent rains of October, 1951 to March, 1952, which resulted in an abundance of vegetative growth at that time, must be considered as being largely responsible for the heavy crop. During this period, and up to July, 1952, the trees' reserves were built up to a high level. From July to December, 1952, the weather was dry; this induced a high crop potential and the irrigations from December onwards brought out the flowerings.

During the last three months of 1953 all the available labour was engaged in dealing with the crop; and the heavy weed growth resulting from the intermittent rain and hot sun during this period could not be controlled. These particular weather conditions were also very favourable to the spread of *Hemileia*, and severe outbreaks occurred in Experiment XVIII. The occurrence of this disease, coupled with the effect of the heavy crop and the heavy weed growth, resulted in severe defoliation of some trees followed by some die-back.

One new experiment (XXII) was planted in April. This experiment is designed to test the effect of irrigation plus mulch on seedling material of a series of selections grown on the single and multiple stem systems; three modifications of each pruning system are to be used.

With a view to finding further high yielding trees, individual tree recording was commenced on the seedling progeny of further selections in Experiment II (Seedling Selection Trials).

The preparation of land for two new experiments, to be planted in 1954, was undertaken. These are (1) a spacing trial in which the effect of inter-planted bananas will also be determined and (2) a selection trial, using single tree plots of seedlings with two clones as "keys", and thirty selections in all. The site for these experiments had previously been planted with Elephant grass (*Pennisetum purpureum*), Giant Cynodon (*Cynodon plectostachyum*), and *Pennisetum salifax*. Great difficulty was experienced in eradicating the two former grasses quickly by mechanical means. The weather conditions prevailing at the time, namely, intermittent sun and rain, increased the difficulties.

In an effort to increase the quantity of trash (stems and leaves) available for mulching from the areas of bananas planted for this purpose, the bananas were clean felled at the beginning of the year. This method not only produced sufficient material to mulch twenty-seven acres of coffee from a similar acreage of bananas, but it also induced considerable sucker growth, and so increased the number of banana stems per acre. The dry weather immediately following felling did not permit the rapid development of the new suckers, and the weed growth, which owing to shortage of labour could not be tackled immediately, impeded the subsequent growth of the suckers. Consequently, it was not advantageous to clean fell a second time at the end of the year. The increased number of stems per acre will increase the yield of mulching material at future cuts, and the increased shade from them will also limit weed growth.

Alterations carried out to the factory included the housing of the engine and pulper in a new building, and the extension of the pre-fermentation washing channels to double their previous length. Innovations have included a simple device to effect the rapid separation of the water from the pulp.

By so doing the degree of pollution is limited, and the water can, if necessary, be pumped back for re-use in pulping. A conveyor belt for the removal of the pulp from immediately behind the pulper to a trailer was also installed.

The construction of the new drying shed was continued; eighteen trays were in use during the season.

Experiments were commenced during the 1952 season to ascertain whether accurate out-turn figures could be obtained by taking samples to the wet parchment stage only and using a factor to convert to clean coffee. These experiments were continued in the 1953 season.

Samples were weighed wet, after pulping and removal of floats, but before fermentation, to see whether this weight could be used as a reliable indication of the final dry weight. If so, a factor obtained from key samples taken right through to dryness, could be used to convert the wet weight to that of the final product.

The results in the 1952 and 1953 seasons have shown that the factor has been too variable to justify its adoption as a general method. But there are indications that the variation has been caused by a few large discrepancies which may have been due to errors in technique, or losses in handling. There is also a seasonal variation in the factor.

Further investigations on these points are being carried out.

If such a method can be shown to be satisfactory, the analyses of the yields from the field experiments would be speeded up considerably.

Improvement of Planting Material

Clonal Selection Trials.

The yields for Experiment XVIII were high in 1953. The yield per acre over the seventeen acres it occupies was 21·7 cwt. of clean coffee.

The progeny plots of KP.423, grown on the multiple stem system, gaves the highest yield of the season with the equivalent of 33·48 cwt. of clean coffee per acre. This is an outstanding clone. Its mean yield over its first seven bearing years is 16·50 cwt. per acre.

The selections from within the Kents strain are of a higher yielding capacity than those from within the Bourbon variety. Of the twelve highest yielding clones, the first six are of the Kents strain, and there is only one Bourbon in the first ten.

The first crop was picked from Experiment XVIIIA. In this extension of the clonal selection trials, planted in 1951, plots have been split for single and multiple stem treatments. The initial capping was at twenty-one inches in both systems, but thereafter two suckers were allowed to grow from the uppermost node of the trees which are to be grown on the multiple stem system. The 1953 crop, however, was taken in each case from the primaries arising from the original stem and little difference between sub-treatments could therefore be expected at this stage.

In each of the two latin squares the two selections from within the Kents strain have yielded higher than the remainder. In Latin Square XVIII, this is in spite of a severe attack of thrips on both F.840 and KP.262 in 1952. In Latin Square XIX, H.61 is the clone, some trees of which have been suffering

from an unexplained die-back for two successive years. This die-back has been so severe in some cases as to render the trees ineffective. In calculating the yields, no account has been taken of this. Reverting to the incidence of the die-back, since it is clonal material it is surprising that some trees should be severely attacked, while others appear to be unaffected.

Clones versus Seedlings.

In Experiment IIIB which was planted in 1951, and in which the yields of clones and seedlings of the same parents are being compared, and also the seedlings of the clone and second generation seedlings, the clonal progeny outyielded the seedlings by a considerable margin in the 1953 season, the first year of bearing. For this experiment the required cuttings were taken in March, 1950 and the seed was sown at the same time.

In the other two experiments where the yields of clones and seedlings are being compared, the yields for the 1953 season made no difference to the findings of previous years. In Experiment III in which the yields for the eleventh to sixteenth years from planting have been recorded, the seedlings have outyielded the clones during that period. In Experiment IIIA the difference for the first nine bearing years is insignificant, although, as in Experiment IIIB, the clones outyielded the seedlings in their first bearing year.

Quality.

Samples of the "A" grade from the progenies in the older clonal selection trials have now been liquored and reported on for six consecutive years. These samples were fermented under water and dried naturally.

Samples from ninety-six selections have now been submitted for liquoring report. In one season at least, every selection has attained a class 3. No selection, in any year, has been below class 5.

Of the sixteen highest yielders only six have failed to reach class 4 or higher in each of the years; their yields range from 11·99 cwt. to 16·50 cwt. of clean coffee per acre.

Closer analysis reveals that the progenies which have shown the greatest consistency in quality over the period are of the Bourbon variety. For example, in four out of the six years N.205 was placed in class 1 and reached class 2 in each of the other two years.

The value of any selection can only be judged by the economic return obtained from it. In this both quality and yield enter in, but, taken generally, the factors affecting yield are more easily controlled than those which influence quality. In these circumstances, and taking into account that all the selections are of good quality, it is sound policy to plant the highest yielding selections.

As external trials of the various selections come into bearing, samples have been prepared and submitted for liquoring reports in the same way as the Station samples. This has now been done for two years in some cases, and although it is as yet too early to make any definite pronouncement, the tendency so far is for the clones to retain their standards in respect of quality under the differing conditions of soil and climate. The exception is from a high altitude plot (approximately 5,700 feet above sea level) where their classifications were lower.

Improvement of Growing Conditions

Cultural Experiments.

During the period 1942–1953 the effects of three levels of mulch (elephant, grass), of compost and of sulphate of ammonia have been investigated (Experiment V). The application of compost at the rate of 30 lb. per tree has given a significant increase in yield over the whole period. The application of twice the amount of compost has not effected a further significant increase. Mulching also has been effective, and again the higher level (80 lb. per tree) does not increase the yield over that effected by the lower level (40 lb. per tree). Throughout the period mulching with elephant grass has not been so consistent in increasing yields as compost. Sulphate of ammonia when applied alone has increased yields, but not significantly so, the lower level of application being more effective than the higher.

The combination of any two of the treatments has no advantages. In fact the combination of sulphate of ammonia with either compost or mulch leads to a depression of yield. This fact when occurring in an experiment of this particular design, obscures the real effect of sulphate of ammonia when applied alone. The individual effects of sulphate of ammonia, nitro-chalk and ammonium nitrate are now being investigated in a further experiment.

Experiment XIX was planted in 1949 with the object of comparing the effects of two densities of bananas and two rates of application of manure on the yields of coffee grown on the multiple stem system. The manurial treatment has been applied to both the coffee and the bananas. In 1953 the second year's yields were recorded and the results confirm those obtained in 1952.

A summary of the results for these two years is given in the following table:—

TABLE I

YIELDS ARE EXPRESSED AS CWT. OF CLEAN COFFEE PER ACRE

MANURE	BANANAS			MEAN
	0. NIL	1. 90 stools/acre	2. 135 stools/acre	
0. NIL	7·38	4·42	4·01	5·27
1. 1 *debe* per tree and per stool ...	9·36	5·93	4·06	6·45
2. 2 *debes* per tree and per stool ...	7·53	5·33	3·80	5·55
MEAN	8·09	5·23	3·96	5·76

Significant Difference for marginal means (Bananas or manure) (P.=·05) ... + 0·90.

The effect of planting bananas at the higher rate of 135 stools per acre is to halve the coffee yields; at 90 stools per acre the coffee yields are very much reduced when compared with those plots with no bananas.

The application of manure at the lower rate has a marked beneficial effect on the yields of plots with no bananas. The higher rate of application gives no increase at all in the same circumstances. The application of both levels of manure to those plots having 90 bananas stools to the acre, does improve the yield of the coffee, but the lower level of application gives the greater increase.

In Experiment IA the effect of mulching with pasture grass mowings (*Cynodon* sp.) and guinea grass (*Panicum maximum*) is being investigated. The application of farmyard manure is a further treatment.

The experiment is laid out on an area of Kents seedling coffee, which was planted in 1935, and the treatments were first applied in 1951. The area is unshaded.

At the time of application, the coffee as a whole was in poor condition; originally this was considered to be due to heavy cropping. It is now obvious that the age of the coffee is a further factor. The results for the last two seasons show no significant differences but it is of interest to note that the lower level of application of guinea grass appears more effective than the higher. The pasture mowings appear to have depressed yields.

The experiment was laid down on this particular coffee in order to gain time, there being no other coffee available then. The mean for the Station over the last six years is almost 9 cwt. per acre; unless the control plots in any experiment yield 5 or 6 cwt. to the acre, a significant increase due to treatments is not of much value. Yields below this figure indicate poor material, inherently poor or induced by treatment or by age.

The experiment will be repeated on mature, but vigorous, coffee as soon as possible.

Pruning Experiments.

In Experiment XIII the records of yields of coffee grown on the single stem and on the multiple stem system are available for sixteen years. The difference between the two systems over this period is twenty-six per cent and in favour of the multiple stem system. If, however, this period is divided into two, namely, the period before the trees on the single stem system have reached maturity and the period subsequent to this, it will be seen that the real advantage of the multiple stem system from the yield point of view, lies in its ability to yield heavier crops at an early age. The mean yields in these two periods are shown in the following table:—

TABLE II

YIELDS ARE EXPRESSED AS CWT. OF CLEAN COFFEE PER ACRE

		Multiple Stem Agobiada	Multiple Stem 3 Suckers	Single Stem	Mean	Std. Error	Signif. Difference (P=·05)
1938–43	Mean Yield ...	5·66	9·46	3·67	6·26	0·28	0·98
	Percentage ...	90	151	59	100	4	16
1944–53	Mean Yield ...	10·11	11·56	11·14	10·94	0·27	0·92
	Percentage ...	92	106	102	100	3	8
1938–53	Mean Yield ...	8·45	10·77	8·34	9·18	0·24	0·82
	Percentage ...	92	117	91	100	3	9

It will be seen that the mean yield for multiple stem (3 suckers) in each of the two periods is high, while a very large increase has been achieved by the single stem in the second period.

In Experiment XX where the effect of time of pruning mature single stem coffee is being investigated, the yield differences for the 1953 crop were insignificant. This may be due in some degree to the habit of biennial bearing. The treatments have now been applied for five seasons and for that period the results show that early pruning is effective in increasing yields. Plots pruned during the month in which harvesting is completed have yielded four cwt. per acre more than those pruned five months later.

The first yields were recorded in Experiment XXI, where two methods of establishment on the single stem system are being compared with three methods of establishment on the multiple stem system. Details of the treatments so far as they have been applied, together with the yields for 1953, are given in the following table:—

TABLE III

YIELDS ARE EXPRESSED AS CWT. OF CLEAN COFFEE PER ACRE

	A SINGLE Capped at 21″ (To be capped thrice in all)	B SINGLE Capped at 36″ (To be capped twice in all)	C MUL-TIPLE Capped at 21″ Three suckers from below 10″	D MUL-TIPLE Single Un-capped Stem	E MUL-TIPLE Capped at 21″ Two suckers from top node	MEAN	STD. ERROR	SIGNIF. DIFFER-ENCE (P=·05)
Cwt. per acre	4·69	6·30	2·75	5·22	3·92	4·57	0·49	1·49
Percentages	103	138	60	114	86	100	10·7	32·6

In treatments A, B, C, and E the 1953 crop was borne in the primaries below the topping height. In the D plots, cropping was not artificially controlled in any way.

Despite the considerable differences in yields between the various treatments, it would be unsound to base any conclusions on the results obtained in this one year. The effect of season, and by that is meant the weather conditions during the six to eight months prior to the flowering which gave rise to the 1953 crop, played an important, if not a dominant part.

An analysis of the effects of season on the results obtained from this experiment, and a comparison with those obtained in Experiment IIIB and Experiment XVIIIA, gives interesting information on the factors involved in early and heavy cropping in young coffee.

The experiment was planted with clonal material of N.197. The plants were selected for size at the time of planting in April, 1951 and all the plots received the same treatment up to the time of capping. It is therefore reasonable to conclude that all the trees in the experiment were at the same nutritional level up to that time.

Capping was done in September, 1952; this coincided with a dry period, which extended until December of that year. Irrigation was then applied and it brought out a flowering. Subsequent irrigation in February induced a further flowering.

The extent of these flowerings, which depended on the nutritional status of the trees at the time, is reflected in the crops recorded from the various treatments. Since there is a considerable difference between these, it must be considered that, in those cases where the yields are low, the nutritional balance necessary to cropping has been upset either by the treatment, or by a combination of treatment and season.

The weather conditions subsequent to capping were not favourable to the growth of suckers in the E and C plots, nor for the extension growth of the main stem in the D plots. As a consequence, the reserves of the trees in these plots were diverted to the maintenance of vegetative growth. On the other hand, these same conditions were conducive to flower bud formation in the A and B plots, where sucker growth was not required at the time, and where any sucker growth was removed at an early stage.

The conditions, therefore, were more favourable to the A and B plots in so far as cropping in 1953 was concerned. (The difference between the yields of the A and B plots is probably explained by the reduced bearing surface of the former. This was accentuated by a delay in capping the A plots, while the B plots were done at the optimum time. This delay resulted in a loss to the trees of the reserves which had gone into the unnecessary extension growth of the main stems, and which, had capping been done earlier, would have produced secondary growth. This secondary growth might have matured sufficiently to have borne a crop).

This view is confirmed by the fact that the yields of the D, C and E plots are related to the number of stems required by the individual treatments. The yield of the D plots, which maintained one sucker in the shape of extension growth of the main stem, was the highest, and the E plots, with three suckers, was the lowest.

Further information on the effect of season can be derived from Experiment IIIB. This experiment, which was also planted in 1951, had made comparable growth with that of Experiment XXI by March, 1952. It was then capped and subsequently trained on the same system as is being used for the E plots of Experiment XXI. In 1953 it yielded an overall average of 8·26 cwt. per acre, against 3·92 cwt. by the E plots of Experiment XXI.

The time of capping in Experiment IIIB preceded the rains of April, May and June. These rains encouraged the development of the required sucker growth and it was well forward by the onset of the dry weather in July, 1952. The suckers of the E plots did not emerge until after capping in September, 1952. In a very few cases the suckers in Experiment IIIB were sufficiently advanced to flower on the lowest pair of primaries in December, 1952.

Although the E plots of Experiment XXI are not strictly comparable with Experiment IIIB, the large difference in yield between them may be considered, at least in part, to be due to the time at which topping was done in this particular season.

Yet further evidence of the effect of time of capping in relation to season is available from Experiment XVIIIA. In this experiment, which was planted in 1951, twelve clones are being grown on the single and on the multiple stem systems. The trees were capped at twenty-one inches. For the multiple stem plots, the same system as that for Experiment IIIB and for the E plots

of Experiment XXI was followed. In March, 1952 the growth in all three experiments was comparable. However, Experiment XVIIIA was capped at a time intermediate between the capping of Experiment IIIB and the C and E plots of Experiment XXI. As in the other two experiments, all crop was taken from the primaries below the topping height.

The yields from the single stem plots of Experiment XVIIIA are practically identical with those of the multiple stem plots. In other words, the production of suckers in the multiple stem plots resulting from capping at this particular time, did not upset the nutritional balance to the detriment of flowering in the following December.

These yields are considerably higher than comparable plots in Experiment XXI, but much lower than that of Experiment IIIB.

It must be emphasized that the material is not the same in all these experiments but factors other than this seem to be responsible, in part at any rate, for the differences in yield. These two factors are:—

(1) the production of suckers at a time favourable to their growth and development, and

(2) early capping. Capping as early as possible avoids wasting the reserves of the tree in extending the main stem unnecessarily.

In Experiment IIIB both factors were operative. In Experiment XVIIIA the conditions favourable to the growth of the suckers occurred but the delay in capping resulted in a wasting of the trees' reserves. In Experiment XXI the delay in capping not only caused a wasting of the trees' reserves, but also resulted in suckers having to be maintained at an unfavourable time.

From the above discussion, and provided good material is planted, and planted properly, the conditions necessary for the early and heavy cropping of young coffee seem to be:—

(1) Uninterrupted growth and development during the first fifteen months in the field. The rainfall conditions from April, 1951, the time at which these experiments were planted, until June, 1952 permitted this. Their effect was considerably enhanced by mulching with banana trash right from the time of planting. These favourable rainfall conditions can be reproduced by frequent irrigations; these should be applied in anticipation of a dry spell, and not delayed in anticipation of rain.

(2) The trees should be ready for capping in March of the year following planting, i.e. in eleven months. The primaries below the capping height should remain.

With the fulfilment of these conditions, the extent of flowering will be determined by the weather conditions in the latter half of the year. A dry time from July to December, or for a portion of it, will induce flower bud formation. If necessary, and where it is available, the flowerings should be brought out by irrigation.

If for any reason the trees have not made sufficient growth to be capped after eleven months in the field, and are to be grown on the multiple stem system, then soil moisture must be maintained until the time of capping, and for a period afterwards. The trees must be maintained in vegetative growth until the suckers are well established.

The grower can do no more; if the conditions are not conducive to flower bud formation in the second season, then they will be favourable to further growth and development. He can then look forward, as always, to "next" year for a bumper crop.

Nurseries

Cuttings.—The monthly planting experiment was continued; no other experiments were undertaken. The rooting of cuttings continued for the following purposes:—

(a) To supply existing experiments;

(b) To produce clonal material as "keys" for new selection trials;

(c) To establish mother-trees of new selections.

Grafting.—With the object of gaining information regarding compatibility, a number of trial grafts were made on miscellaneous rootstocks, using the clone N.39 as the scion. Unfortunately, wet weather ensued each time before a satisfactory union had been effected; the result was excessive "bleeding" of the stock and subsequent rotting of the top of the stock, causing the death of the scion.

Seedlings.—Extensive new nurseries were prepared, and seed was sown for the two new experiments mentioned above. Seed of some twenty-seven new introductions was also sown.

Breeding.—A preliminary breeding programme was started. Reciprocal crosses of H.66, KP.423, and N.39 were made; in addition, all three were crossed with *C. arabica*, var. *Geisha*, which appears to have a high degree of resistance to *Hemileia vastatrix*, and with *C. arabica*, var. *Amphillo*. Fruits from all these were harvested and the seeds were prepared.

Towards the end of the year both N.39 and KP.423 were crossed with *C. arabica*, var. *Geisha* and with *C. salvatrix*, also apparently resistant to leaf rust. An experiment was also undertaken to test the efficiency of the present methods.

Pests and Diseases

White Stem Borer—(*Anthores leuconotus*).—Towards the end of the year, experiments at the lower end of the Station were treated with Dieldrin. The method of application was by spraying the bottom eighteen inches of all stems with a hand fog-sprayer.

Antestia—(*Antestia lineaticollis*).—D.D.T. was incorporated in the two routine fungicidal (copper) sprays as a precaution. Test spraying later in the year revealed the necessity for additional applications of D.D.T. on a few experiments.

Leaf-miner—(*Leucoptera* spp.).—A very severe attack, resulting in almost complete defoliation on some trees, occurred towards the end of the year in Blocks 28 and 29 on Lyamungu Coffee Estate, and to a lesser extent in some experiments.

Mites—(*Hemitarsonemus latus*).—Some curling and distortion of the young leaves again occurred especially on unshaded coffee, but no serious damage was caused.

Mealy bug—(*Pseudococcus filamentosus*).—Incidence of this pest was fairly general in Experiment XV early in the year, but declined later.

Green Scale—(*Coccus africanus* and *Coccus viridis*).—Both Alboleum and Triona were used against green scale; the latter was the more effective.

Leaf Rust—(*Hemileia vastatrix*).—As is usual after a heavy crop, this disease was fairly widespread throughout the Station, but was especially severe in the clonal selection trials. Some varieties of arabica in the variety collection have exhibited a considerable degree of resistance, and some of these have already been used in the preliminary breeding programme mentioned earlier.

A fungicidal trial was laid down early in the year, but unfortunately the incidence of disease in the particular area of the trial was only slight and no definite conclusions could be drawn.

A form of die-back was found on young trees in Experiment XVIIIA. Except for two other trees slightly affected, this condition was confined to trees of the clone H. 61. The Plant Pathologist has isolated species of *Phomopsis* and *Colletotrichum* from the affected twigs, but these may be secondary infections only. The matter is still under investigation.

Chemist's Report

Complete soil analysis of the sixty-four plots of the irrigation and mulch experiment (XV) has shown that banana trash mulch, both with and without irrigation treatments, has, over thirteen years, significantly increased organic matter, exchangeable calcium and potassium. These increases have been quite large, potassium being increased by about 100 per cent. There has also been an increase in half a pH unit in soil reaction, and an increase in the percentage of water-stable aggregates of greater diameter than 0·5 mm. Analysis of another mulch experiment (XIVA) has also shown similar conditions to hold for organic matter and soil reaction under banana trash mulch but not under elephant grass mulch. Other experiments involving mulches are to be sampled and analysed in 1954.

Regular soil sampling and nitrate determinations under mulches applied before and after the rains, have shown the initial advantage with regard to nitrate level to lie with mulch applied before the rains, but that this advantage gradually decreases throughout the year. Further experiments are contemplated.

Gypsum soil-moisture measuring blocks have been calibrated with a view to installing them in the irrigation and mulch experiment.

Experiments on the artificial fermentation of coffee have shown that overnight fermentation can be economically achieved with commercial pectic enzymes, but there has so far been a loss of quality in the coffee to the extent of one class.

Miscellaneous work done includes the analyses of soil samples from four estates, irrigation, silage and compost samples, and various moisture determinations for coffee drying experiments on the Station.

Weedicide Observation Trial

A number of trials were carried out during the year for the eradication of "sangare" (*Digitaria scalarum*) with trichloroacetic acid (T.C.A.). At varying rates of application below seventy pounds per acre, only the "sangare" growing within two to three inches of the surface was killed and the deeper-rooted rhizomes remained unaffected. Coffee trees to which the treatments were applied showed a chlorosis and distortion of the leaves, which eventually dropped to the ground resulting in die-back of many of the branches. The foliage on the trees had fully recovered, however, ten months after the application of the treatments, but the crop was considerably reduced.

Eleven liquoring samples were taken and two of these from plots receiving the highest rate of application (seventy pounds per acre T.C.A.), were reported upon as having "an unclassified flavour". The remaining samples were not adversely affected.

Another trial showed that T.C.A. applied at 100 lb. per acre killed approximately seventy-five per cent of a thick stand of "sangare". A second application at the same rate is to be applied, and it is thought that this will eradicate the "sangare" completely.

T.C.A. cannot yet be recommended for general use until more is known about the optimum rates of application and the effects upon the liquoring qualities of coffee. Rainfall immediately following application is also an important aspect which requires further study. It is apparent from the trials undertaken to date that coffee trees will probably suffer a severe set-back for some time after the application of the chemical to the soil, but complete recovery may occur after about a year.

In assessing the value of T.C.A., consideration must be given to the effect on the tree of the removal of "sangare" by the use of forked hoes. This also causes a severe set-back to the trees.

Artificial Drying

During the year a few tests were carried out, using (a) a wood-fired rotating drum type of coffee drier and (b) an oil-fired heater and fan unit which is normally used for drying grain in the sack.

(a) *Rotating drum drier.*—Four test runs were made with this drier, two at 80°C and two at 65°C. The machine was run about half-full. These runs were insufficient to obtain a good average of the drying rate at the two temperatures, but in general it took twenty to twenty-five hours to reduce the moisture content of the coffee from about forty per cent to about twelve per cent. The machine is an old one and its performance would be improved by lagging the hot air flues, and paying more minute attention to leaks in the system.

Liquoring reports on the dried coffee varied considerably and much more work will have to be done before a definite conclusion can be reached on the effect of this drier on cup quality and appearance.

(b) *Oil-fired heater unit.*—Four test runs were carried out, using the heater and fan unit in conjunction with a wooden duct made to carry five coffee trays of normal pattern.

The temperature used (about 15°C above ambient temperature) was the standard temperature for the machine. The area of the trays was altogether ninety square feet.

Two runs were carried out with a three-inch layer of coffee on the trays, and two runs with a six-inch layer. Here again, the number of tests does not justify drawing rigid conclusions, but the indication so far is that the thicker layer does not slow up the drying rate appreciably.

In the tests it took fifteen to twenty-five hours to reduce the moisture content from about forty-five per cent to about twelve per cent.

The exhaust gas from the combustion chamber is blown through the coffee with the drying air. It was thought that this might be a source of taint, so liquoring samples were taken. Results were variable, though it would seem possible to dry without tainting on this machine. Many more runs would have to be made to confirm this definitely.

I am indebted to Mr. Woodforde and the staff of the Grain Drying Department, National Institute of Agricultural Engineering in England, for help and advice on the subject of drying coffee, and also for carrying out preliminary drying experiments on their laboratory drier.

Mbozi Sub-Station

Observations on the incidence of "black tip" and die-back were continued.

The Government Chemist has also continued his investigations into the causes of "wither tip" in the Mbozi area. As a result of these, he concludes that there is a good deal of support for the idea that "wither tip" is due to primary calcium deficiency, with uptake complications, due to excess manganese and perhaps deficient soil boron.

Two practical ways of overcoming this deficiency are now being investigated. They are:—

(1) The application of lime to coffee trees by spraying, and

(2) the application of lime to the soil by compost fortified with calcium.

Animal Husbandry

At the end of the year the Zebu herd consisted of ninety-three cows, heifers and heifer calves, forty-four bullocks and bull calves, and two bulls. The second bull, a three-quarter pure bred Guernsey, was purchased as a yearling in December with a view to grading up the herd and improving milk yields.

Nineteen bull calves and twenty-eight heifers were born and ten of the lowest yielding cows were culled. Nine bullocks were slaughtered to provide meat for the labour.

There was a marked absence of disease amongst the full-grown stock. There were two cases of Anaplasmosis which recovered after treatment and one suspected case of "fly". Scouring and other stomach ailments accounted for several deaths amongst the bucket-fed calves, but towards the end of the year a system of suckling was introduced whereby the dam was partially milked by hand and the calf finished the remainder. Calves suckled in this way were noticeably healthier than the bucket-fed calves, and the cows appeared to produce more milk under this suckling system.

Throughout the year there was an abundance of grass for grazing and the hairless type of elephant grass was fed to the cattle at night. Approximately two hundred tons of good quality silage was made from maize chopped in a roughage mill and blown into pits.

Ecological conditions in this locality do not appear to suit the black-headed Persian flock of sheep as their growth rate is poor and prolificacy below average. A half-bred Wiltshire horn ram was therefore purchased in an attempt to bring about an all-round improvement in the flock.

Visitors

Visitors to the Station included the Honourable the Director of Agriculture, the Agricultural Adviser to the Ford Motor Company, members of a Dutch Agricultural Mission, and M. Euverté of the Service l'Agriculture, Madagascar.

Several parties of students from local schools visited the Station and were shown its activities.

Coffee Research Station,
Lyamungu, Moshi,
October, 1954

F. R. Sanders,
Senior Research Officer

DETAILS AND RECORDS OF EXPERIMENTS

All yields are expressed as cwt. of clean coffee per acre.

Unless otherwise stated, an out-turn figure of sixteen per cent has been used when converting weights of cherry to their equivalent in clean coffee.

A difference between any two treatments greater than the figure given as "significant difference" can be considered as being due to the particular treatment. Unless otherwise stated, the figure for significant difference is at the level of probability of P=0·05, at this level of probability the chances against drawing the wrong conclusion by using the significant difference figure is nineteen to one.

EXPERIMENT XVIII—CLONAL SELECTION TRIALS

These trials consist of a series of 6 x 6 Latin squares, wherein the yields of rooted cuttings of potential selections are compared. Planting commenced in April, 1943; additional squares have been planted up subsequently, as material became available. By the end of 1951 sixteen squares had been planted, of which fourteen were in bearing. All squares planted prior to April, 1944 (eight in number) have been pruned on the single stem system; those planted subsequently have been grown on multiple stem. Each square is planted with the following shade tree, so that each of the six plots of any one clone has a different semi-permanent shade tree.

Semi-permanent :—

Albizzia moluccana
Albizzia stipulata
Albizzia sp. ("Tangasale")
Cordia holstii
Ficus sycamorus
Maesopsis eminii

Permanent :—

Albizzia Maranguensis

Yearly yields and mean yields for each square are given below, the calculated yields of the original parents being included for reference.

EXPERIMENT XVIII—LATIN SQUARE I.—PLANTED 29.4.43—SINGLE STEM

PARENT												
Mean Yield	No. of years re-corded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Mean of 9 years 1945–53
												Cwts. / Per-centages
16·83	7	N 39	4·84	1·30	*13·61	2·46	11·49	15·53	16·35	2·93	22·48	10·10 / 97
10·17	7	R 23	1·29	1·44	12·32	0·52	16·94	10·40	17·68	2·11	22·50	9·47 / 91
13·59	7	N 71	1·37	2·18	12·09	1·12	16·36	12·73	17·41	1·39	21·21	9·52 / 91
32·48	1	I 60	2·04	3·52	14·98	1·10	16·45	18·51	15·29	4·91	25·43	11·46 / 110
6·69	4	M 2	1·90	3·37	12·07	1·97	15·02	15·42	18·30	2·04	22·78	10·32 / 99
11·44	8	L 1	2·33	2·04	14·45	1·23	18·12	16·33	18·56	3·74	28·18	11·66 / 112
Mean			2·29	2·31	13·25	1·40	15·73	14·82	17·24	2·85	23·76	10·42 / 100
Standard Error ...			0·26	0·45	–	0·32	0·82	1·59	1·37	0·45	1·00	0·22 / 2
Significant Difference (P = ·05)			0·76	1·32	–	0·94	2·42	4·70	–	1·33	2·94	0·65 / 6

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE II.—PLANTED 30.4.43—SINGLE STEM

PARENT											Mean of 9 years 1945–53	
Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Cwts.	Percentages
17·12	7	N 20	1·44	2·22	10·54	1·25	13·25	14·85	13·88	2·47	27·58	9·71	95
12·54	7	N 30	2·98	0·95	10·54	0·86	12·61	11·84	17·94	2·15	23·51	9·27	91
14·39	7	N 29	3·03	2·43	12·31	1·59	13·71	12·93	18·47	2·34	24·69	10·16	100
14·55	7	N 5	5·29	0·93	*12·92	1·06	10·92	12·76	20·95	3·18	23·60	10·17	100
32·04	1	N 48	2·06	2·43	10·81	0·73	15·20	16·04	14·14	2·17	26·52	10·01	98
13·88	7	N 197	4·17	5·33	*14·07	1·60	15·92	18·58	15·20	3·98	27·25	11·78	116
Mean			3·17	2·39	11·87	1·18	13·60	14·50	16·79	2·71	25·53	10·18	100
Standard Error ...			0·33	0·46	–	0·18	0·81	1·43	1·28	0·44	0·87	0·27	3
Significant Difference (P = ·05)			1·39	1·35	–	0·53	2·38	4·22	3·78	1·30	2·55	0·80	8

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE III.—PLANTED 26.10.44—MULTIPLE STEM

PARENT										Mean of 7 years 1947–53	
Mean Yield	No. of years recorded	Clone	1947	*1948	*1949	*1950	*1951	*1952	*1953	Cwts.	Percentages
14·55 ...	7	N 5	*6·26	11·42	14·39	11·88	10·87	6·81	24·09	12·24	95
13·77 ...	6	AB 35	4·56	11·60	11·63	13·79	11·84	5·45	23·91	11·83	92
11·49 ...	12	KP 154	3·25	13·40	15·33	19·98	9·55	7·64	28·51	13·95	109
14·78 ...	12	KP 423	6·82	13·48	14·11	26·18	12·55	8·90	33·48	16·50	129
15·04 ...	4	M 97	5·51	10·51	10·99	9·29	8·66	5·29	31·62	11·69	91
2·13 ...	7	N 106	5·79	8·10	10·24	10·12	7·51	5·45	27·53	10·68	83
Mean			5·37	11·42	12·78	15·20	10·16	6·59	28·19	12·82	100
Standard Error			–	0·62	0·93	1·36	1·15	0·63	1·49	0·36	3
Significant Difference ... ... (P = ·05)			–	1·84	2·73	4·01	3·39	1·85	4·40	1·07	8

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE V.—PLANTED 14.4.49—MULTIPLE STEM

PARENT			*1951	*1952	*1953	Mean of 3 years 1951–1953	
Mean Yield	No. of years recorded	Clone				Cwts.	Percentages
11·44 ...	8	L 1	3·57	7·80	16·63	9·33	98
16·19 ...	5	X 208	3·13	9·02	21·05	11·07	117
12·32 ...	5	U 329	3·19	8·29	17·93	9·80	103
13·66 ...	5	Q 89	3·14	8·59	12·48	8·07	85
16·60 ...	5	X 216	3·57	9·28	19·85	10·89	115
8·89 ...	10	AB 37	2·81	8·34	12·12	7·76	82
Mean			3·24	8·55	16·68	9·48	100
Standard Error			0·44	0·64	1·48	0·55	6
Significant Difference (P=·05)			–	–	4·38	1·64	17

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE VI.—PLANTED 15.4.49—MULTIPLE STEM

PARENT			*1951	*1952	*1953	Mean of 3 years 1951–1953	
Mean Yield	No. of years recorded	Clone				Cwts.	Percentages
16·83 ...	7	N 39	4·16	8·77	25·59	12·83	134
14·23 ...	7	N 219	2·73	7·50	13·82	8·02	84
15·19 ...	5	X 125	2·46	7·83	19·10	9·80	102
11·85 ...	14	KP 146	2·64	7·78	18·46	9·63	101
16·34 ...	5	X 297	3·06	9·02	19·58	10·55	110
12·13 ...	7	I 89	1·64	5·14	13·10	6·63	69
Mean			2·78	7·67	18·28	9·58	100
Standard Error			0·55	0·87	1·39	0·77	8
Significant Difference (P=·05)			–	–	4·09	2·27	24

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE VII.—PLANTED 7.6.43—SINGLE STEM

PARENT											Mean of 9 years 1945–53	
Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Cwts.	Percentages
13·87	7	R 15	3·63	2·50	*13·13	0·94	17·81	15·86	16·54	2·46	18·77	10.18	104
11·23	7	N 81	3·76	3·65	15·43	2·92	16·39	14·04	16·89	3·06	23·33	11.05	113
9·60	12	KP 228	2·80	2·80	14·62	5·79	14·37	18·06	18·54	5·48	20·21	11·41	117
10·45	7	I 49	2·14	1·43	10·78	1·24	14·75	18·76	10·17	3·92	16·13	8·82	90
3·75	3	S 16	2·32	0·95	10·43	1·18	11·33	12·09	11·20	1·46	18·69	7·73	79
15·19	7	N 34	1·68	1·90	10·57	1·28	17·57	17·07	12·33	2·84	19·56	9·42	96
Mean			2·73	2·21	12·49	2·23	15·37	15·99	14·28	3·20	19·45	9·77	100
Standard Error ...			0·44	0·38	–	0·42	0·78	1·61	0·83	0·47	1·20	0·37	4
Significant Difference... (P = ·05)			1·30	1·12	–	1·25	2·30	–	2·45	1·38	3·54	1·10	11

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE VIII.—PLANTED 13.8.43—SINGLE STEM

PARENT											Mean of 9 years 1945–53	
Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Cwts.	Percentages
14·02	7	R 2	2·38	4·55	13·75	1·28	19·36	9·71	17·23	3·74	28·86	10·32	95
11·27	4	H 66	2·58	3·47	*20·28	7·72	14·55	18·18	16·83	13·98	26·34	13·77	126
6·14	4	M 7	1·46	3·48	11·24	1·96	17·22	12·32	13·83	5·38	16·51	9·28	85
11·95	6	AB 92	0·95	3·20	11·43	2·36	16·16	15·32	13·68	5·63	18·27	9·67	89
15·04	7	N 218	2·23	2·25	14·62	3·26	16·67	13·57	17·32	5·75	21·68	10·82	99
13·58	7	N 100	2·22	4·65	*14·30	1·77	20·09	13·69	17·98	4·65	24·42	11·53	106
Mean			1·97	3·59	14·27	3·06	17·34	13·79	16·15	6·52	21·35	10·90	100
Standard Error ...			0·35	0·47	–	0·68	1·20	1·20	1·26	0·74	0·96	0·25	2
Significant Difference (P = ·05)			1·02	1·38	–	2·00	3·54	3·54	–	2·19	2·84	0·73	7

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE IX.—PLANTED 20.12.43—SINGLE STEM

PARENT		Clone	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Mean of 8 years 1946–53	
Mean Yield	No. of years recorded										Cwts.	Per-cent-ages
10·49	6	AC 98	4·07	9·54	4·24	14·07	11·42	10·88	6·39	15·65	9·54	89
18·38	7	R 3	5·22	10·12	1·70	18·43	6·54	14·81	3·50	19·31	9·59	90
10·62	12	KP 683	4·46	13·63	4·78	14·54	8·33	12·09	6·83	21·61	10·78	101
14·07	7	N 205	6·60	13·02	3·10	18·30	10·73	16·03	5·90	22·29	11·99	112
10·94	7	N 128	4·87	12·91	1·75	17·37	5·02	16·37	3·77	29·11	11·39	107
11·29	7	I 5	4·58	10·39	2·87	17·52	7·83	15·57	3·98	22·74	10·69	100
Mean			4·96	11·60	3·07	16·71	8·31	14·29	5·06	21·79	10·66	100
Standard Error			–	–	0·51	1·36	1·26	0·86	0·63	0·73	0·38	4
Significant Difference (P = ·05) ...			–	–	1·40	–	3·72	2·53	1·85	2·17	1·12	11

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE X.—PLANTED 29.12.43—SINGLE STEM

PARENT		Clone	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Mean of 8 years 1946–53	
Mean Yield	No. of years recorded										Cwts.	Per-cent-ages
36·90	1	N 110	4·79	12·99	3·02	11·45	11·03	10·48	10·98	27·27	11·50	97
7·37	3	M 95	4·13	11·16	0·93	13·22	13·25	7·58	6·09	19·27	9·45	80
11·28	12	KP 532	5·36	16·03	8·32	14·84	15·50	17·01	12·42	27·49	14·63	124
13·88	7	N 197	9·50	*13·70	3·13	17·31	16·02	10·79	10·73	20·59	12·72	108
11·98	7	I 235	5·15	12·05	2·38	15·73	15·55	12·08	5·95	20·48	11·17	94
11·71	7	R 11	5·18	11·14	1·62	16·45	11·97	12·24	6·29	26·36	11·40	96
Mean			5·69	12·85	3·24	14·83	13·89	11·69	8·74	23·57	11·81	100
Standard Error			–	–	0·64	0·85	1·63	1·10	1·09	1·09	0·34	3
Significant Difference (P = ·05) ...			–	–	1·90	2·50	–	3·24	3·21	3·21	1·02	9

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XI.—PLANTED 16.4.46—MULTIPLE STEM

PARENT										
Mean Yield	No. of years recorded	Clone	*1948	*1949	*1950	*1951	*1952	*1953	Mean of 6 years 1948–53	
									Cwts.	Per-cent-ages
9·22 ...	11	KI 363	3·01	16·34	13·92	15·10	4·87	26·41	13·28	118
13·88 ...	7	N 197	1·18	10·91	14·93	6·05	4·53	21·11	9·78	87
13·58 ...	7	N 100	1·80	12·88	17·65	8·20	4·68	21·04	11·04	98
18·38 ...	7	R 3	1·20	10·68	12·21	6·81	4·73	21·99	9·60	85
14·55 ...	7	N 5	1·67	18·14	12·99	10·23	7·33	24·69	12·51	111
16·83 ...	7	N 39	1·08	14·56	12·53	12·43	4·54	22·20	11·23	100
Mean			1·66	13·91	14·04	9·80	5·12	22·91	11·24	100
Standard Error			0·21	0·91	1·18	0·89	0·76	0·95	0·37	3
Significant Difference (P = ·05)			0·61	2·69	3·48	2·63	–	2·82	1·10	10

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XII.—PLANTED 16.4.46—MULTIPLE STEM

PARENT										
Mean Yield	No. of years recorded	Clone	*1948	*1949	*1950	*1951	*1952	*1953	Mean of 6 years 1948–53	
									Cwts.	Per-cent-ages
10·81	12	KP 227	3·16	17·89	18·65	11·00	6·05	22·94	13·29	113
11·81	7	N 181	3·50	17·94	11·20	7·69	7·45	20·00	11·30	96
13·58	7	N 100	3·29	13·93	16·20	6·14	4·37	23·97	11·31	96
10·03	7	R 24	1·76	11·99	16·40	5·08	5·82	26·43	11·25	96
13·11	12	KP 231	0·89	12·41	19·24	8·97	4·50	17·57	10·60	90
12·55	12	KP 163	3·32	18·53	17·77	8·42	5·39	23·79	12·87	109
Mean			2·65	15·45	16·57	7·88	5·60	22·45	11·76	100
Standard Error			0·55	1·15	1·15	0·81	0·63	1·48	0·51	4
Significant Difference (P=·05)			1·62	3·39	3·38	2·40	1·85	4·36	1·51	13

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XIII.—PLANTED 26.4.46—MULTIPLE STEM

PARENT		Clone	*1948	*1949	*1950	*1951	*1952	*1953
Mean Yield	No. of years recorded							
11·27	5	X 321	2·71	13·69	17·86	12·63	8·57	25·41
10·76	6	AC 189	3·49	7·71	13·12	6·97	4·56	22·03
13·58	7	N 100	0·79	8·60	19·21	6·32	4·45	21·61
13·87	7	R 15	–	–	9·86	8·88	6·55	19·12
6·74	12	KP 162	–	–	10·40	12·15	7·82	26·81
10·49	6	AC 98	–	–	11·56	9·71	5·59	16·62

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XIV.—PLANTED 21.5.47—MULTIPLE STEM

PARENT		Clone	*1949	*1950	*1951	*1952	*1953	Mean of 4 years 1949–53	
Mean Yield	No. of years recorded							C wts.	Per-cent-ages
18·38	7	R 3	0·38	6·56	10·38	5·15	19·52	8·30	84
15·20	7	N 50	0·57	6·44	7·40	4·76	19·29	7·69	78
15·87	4	H 1	0·49	5·92	14·73	8·54	23·56	10·65	108
10·59	6	AC 53	0·42	8·52	11·96	5·55	21·50	9·59	97
36·90	1	N 110	0·58	8·59	15·29	6·00	21·39	10·37	105
Unknown	–	KIL 10	0·46	6·31	19·45	10·28	26·59	12·61	128
Mean			0·49	7·06	13·20	6·72	21·97	9·86	100
Standard Error			0·13	0·92	1·15	0·85	1·03	0·52	5
Significant Difference (P=·05)			–	–	3·39	2·50	3·05	1·54	16

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XV.—PLANTED 26.1.44—SINGLE STEM

PARENT										Mean of 8 years 1946–53	
Mean Yield	No. of years recorded	Clone	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Cwts.	Per-centages
11·95 ...	6	AB 11	1·63	12·63	2·61	11·99	9·55	5·56	7·81	13·42	8·15	95
15·20 ...	7	N 50	0·82	9·82	1·72	13·88	7·34	6·55	9·93	17·70	8·47	99
11·44 ...	8	L 1	1·17	13·66	2·74	13·52	6·69	8·09	11·80	19·29	9·63	112
9·32 ...	12	KP 263	1·54	9·62	6·38	8·29	11·60	4·43	16·86	12·11	8·87	103
11·83 ...	7	I 47	1·23	10·73	2·23	12·31	5·88	7·82	7·90	17·81	8·24	96
14·08 ...	7	N 215	1·95	9·97	1·79	11·91	5·81	8·56	7·85	17·81	8·21	96
Mean			1·39	11·07	2·91	11·99	7·81	6·83	10·36	16·35	8·59	100
Standard Error			–	–	0·61	1·00	1·00	0·75	1·17	0·72	0·30	3
Significant Difference (P=·05) ...			–	–	1·79	2·94	2·96	2·22	3·44	2·14	0·88	10

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XVI—PLANTED 3.3.44—SINGLE STEM

PARENT										Mean of 8 years 1946–53	
Mean Yield	No. of years recorded	Clone	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Cwts.	Per-centages
11·27 ...	7	N 198	0·72	7·93	2·67	13·30	11·44	11·66	6·07	21·89	9·47	97
18·38 ...	7	R 3	0·66	7·88	0·87	13·23	10·90	11·89	7·22	23·11	9·48	97
8·38 ...	7	R 25	0·66	7·04	2·01	11·49	9·96	12·59	5·92	21·33	8·88	91
12·63 ...	7	N 76	0·83	8·85	3·89	13·77	14·09	10·74	7·82	21·67	10·20	104
13·31 ...	7	N 220	0·86	4·85	2·87	10·52	9·88	11·04	5·39	20·35	8·22	84
13·88 ...	7	N 197	1·33	*9·29	5·34	17·66	19·68	13·76	8·09	25·08	12·52	128
Mean			0·85	7·64	2·94	13·23	12·66	11·95	6·75	22·24	9·79	100
Standard Error			–	–	0·60	0·70	0·87	0·54	0·74	1·26	0·28	3
Significant Difference (P=·05) ...			–	–	1·78	2·08	2·57	1·59	2·19	–	0·83	8

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQ'JARE XVII.—PLANTED 13.9.45—MULTIPLE STEM

PARENT Mean Yield	No. of years recorded	Clone	*1948	*1949	*1950	*1951	*1952	*1953	Mean of 6 years 1948–53	
									Cwts.	Per-centages
6·74	12	KP 162	6·76	17·91	24·94	12·45	6·62	24·69	15·56	134
15·19	7	N 34	7·20	15·79	19·37	7·73	6·39	19·18	12·60	108
14·71	7	N 14	1·90	8·89	11·44	7·65	6·59	21·81	9·51	82
12·66	7	I 56	4·84	11·81	15·35	6·40	8·52	21·77	11·45	98
18·38	7	R 3	4·99	11·86	12·89	6·21	6·37	19·03	10·23	88
7·13	7	F 502	6·05	9·94	16·54	6·35	3·46	20·99	10·54	90
Mean			5·29	12·70	16·75	7·80	6·33	21·25	11·65	100
Standard Error			0·91	1·05	1·09	1·03	0·70	1·83	0·57	5
Significant Difference (P=·05)			2·67	3·10	3·33	3·02	2·06	–	1·70	15

*Using actual out-turn.

EXPERIMENT XVIIIA—CLONAL SELECTION TRIALS

These two 6 x 6 Latin Squares are an extension of Experiment XVIII. In addition to the testing of rooted cuttings of selections, each plot is split to compare single and multiple stem systems of pruning.

EXPERIMENT XVIIIA, 1953 CROP—LATIN SQUARE XVIII—PLANTED APRIL, 1951 YIELDS EXPRESSED AS CWT. CLEAN COFFEE PER ACRE

	KP262	R1	Q73	N101	F840	N39	Mean (Pruning)
Single Stem	6·68	4·16	5·07	3·50	7·94	6·73	5·68
Multiple Stem	7·17	5·08	5·07	3·58	8·75	5·61	5·88
Mean (Selections)	6·92	4·62	5·07	3·54	8·34	6·17	5·78

Standard Error for Pruning ± 0·32.
Standard Error for Selections ± 0·31.
Significant Difference for Selections ± 0·92.

EXPERIMENT XVIIIA, 1953 CROP—LATIN SQUARES XIX—PLANTED APRIL, 1951 YIELDS EXPRESSED AS CWT. CLEAN COFFEE PER ACRE

	AC83	N299	H61	R12	KP265	R3	Mean (Pruning)
Single Stem	5·86	6·10	7·99	6·76	8·45	6·05	6·87
Multiple Stem	5·97	6·00	7·85	6·00	8·14	6·72	6·78
Mean (Selections)	5·92	6·05	7·92	6·38	8·30	6·39	6·83

Significant Difference for Selections ± 0·80.
Standard Error for Selections ±0·27.
Standard Error for Pruning ± 0·17.

EXPERIMENT IV—SQUARES II, V AND IX—CLONAL SELECTION TRIALS

The three original squares in Experiment IV were uprooted, because of the unsuitability of the various exotic coffee planted therein. As material became available, they were each replanted with the same five clones, Squares II and V being grown on the single stem system and Square IX on multiple stem. The spacing is 8 ft. x 8 ft. apart.

The results have been disappointing, probably due to the heavy shade, prior to 1948, of *Acrocarpus fraxinifolius*, *Cordia holstii*, and *Albizzia maranguensis*, and the previous existence of coffee in the area. The yields since the reduction of the shade have shown considerable improvement.

EXPERIMENT IV—LATIN SQUARE II.—PLANTED 13.4.43—SINGLE STEM

PARENT											Mean of 9 years 1945–53	
Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	*1953	Cwts.	Percentages
16·83	7	N 39	1·11	Crop Failed	4·84	2·34	5·63	16·41	11·44	0·39	13·82	6·14	95
18·38	7	R 3	1·31		6·56	0·38	9·70	10·13	10·94	0·44	12·39	5·66	87
11·44	8	L 1	1·40		8·21	1·51	12·52	14·78	12·61	0·73	14·63	7·25	112
13·58	7	N 100	1·19		7·64	1·01	9·90	12·88	12·19	0·46	13·64	6·42	99
13·88	7	N 197	1·64		8·08	1·48	10·23	15·60	11·35	0·72	14·35	6·92	107
Mean			1·33		7·07	1·34	9·60	13·96	11·69	0·55	13·77	6·48	100
Standard Error			0·15		–	0·351	0·64	0·94	0·87	0·11	0·68	0·18	3
Significant Difference ...			0·45		–	1·083	1·98	2·90	–	–	–	0·54	8

*Using actual out-turn.

EXPERIMENT IV—LATIN SQUARE V.—PLANTED 9.4.42—SINGLE STEM

PARENT											Mean of 9 years 1945–53	
Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	†1953	Cwts.	Percentages
16·83	7	N 39	2·47	Crop Failed	3·28	5·76	4·82	21·76	9·68	0·60	14·71	6·96	94
18·38	7	R 3	4·37		8·52	0·88	10·30	12·45	11·77	0·41	13·77	6·80	92
11·44	8	L 1	3·86		9·58	1·51	11·12	16·78	11·85	0·96	15·17	7·73	105
13·58	7	N 100	2·97		9·74	0·93	11·66	14·98	11·60	0·52	14·93	7·33	99
13·88	7	N 197	4·23		10·09	2·65	11·27	18·84	10·35	1·17	14·93	8·01	109
Mean			3·58		8·24	2·35	9·83	16·97	11·02	0·73	14·70	7·37	100
Standard Error ...			0·33		–	0·459	0·94	1·21	0·80	0·08	1·02	0·26	4
Significant Difference (P=·05)			1·02		–	1·415	2·91	3·72	–	0·25	–	0·80	11

*Using actual out-turn. †Using random sample.

EXPERIMENT IV.—LATIN SQUARE IX.—PLANTED 17.3.44—MULTIPLE STEM

PARENT Mean Yield	No. of years recorded	Clone	*1948	*1949	*1950	*1951	*1952	†1953	Mean of 6 years 1948–53	
									Cwts.	Per-centages
16·83	7	N 39	2·19	11·30	4·05	12·61	2·61	12·44	7·53	107
18·38	7	R 3	2·34	7·18	6·22	10·10	1·95	10·13	6·32	90
11·44	8	L 1	1·94	7·09	7·71	8·35	3·71	11·25	6·68	95
13·58	7	N 100	2·61	9·30	7·03	8·60	2·10	11·25	6·81	97
13·88	7	N 197	2·86	10·08	7·78	9·35	3·82	12·95	7·81	111
Mean			2·39	8·99	6·55	9·77	2·84	11·60	7·03	100
Standard Error			0·440	1·06	0·65	1·15	0·33	0·64	0·34	5
Significant Difference (P=·05)			–	–	1·99	–	1·00	–	1·05	15

*Using actual out-turn. †Using random sample.

EXPERIMENT II—SEEDLING SELECTION TRIALS

These trials are laid out in the form of four 6 x 6 latin squares, and two randomized blocks, each with nine selections repeated six times. The object of the experiment is to compare the yields of seedling progeny of potential selections under the conditions existing at this Station. The area had high light shade of *Albizzia maranguensis*, *Cordia Holstii*, and *Leucaena glauca*, until June, 1950, but in that year Leucaena glauca was removed.

The yearly yields, and means over the bearing period, are given below and are expressed as cwts. of clean coffee per acre. The calculated yields of the parent trees, from which the original seed was obtained, are also given as a matter of interest, together with the number of years for which each tree was recorded. No direct comparison between these latter is possible, however, except where they bear the same initial letter, since they originate from estates often in widely differing districts.

EXPERIMENT II.—LATIN SQUARE I.—PLANTED MAY, 1938—SINGLE STEM

SUMMARY OF RESULTS FOR 1941–53

Yields calculated as cwts. of clean coffee per acre

PARENT															Mean of 13 years 1941–1953	
Mean Yield	No. of years recorded	Selection	1941	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	†1953	Cwts.	Percentages
7·13	7	F 502	1·32	2·65	6·82	8·42	3·94	5·02	16·32	4·14	14·00	6·35	17·55	3·81	6·31	7·43	123
15·00	5	P 280	1·21	4·35	7·01	7·87	2·55	4·85	13·84	1·80	12·15	5·48	14·57	2·03	4·75	6·34	105
11·88	5	P 313	0·95	4·60	6·17	8·30	2·57	4·45	13·78	4·37	12·12	6·63	17·73	1·63	6·21	6·89	114
12·32	5	P 348	0·84	2·07	4·43	6·38	1·19	5·31	9·75	4·63	9·42	5·05	14·90	3·40	4·64	5·54	92
13·17	5	P 147	0·73	1·57	3·82	5·96	1·54	4·20	10·09	4·88	8·99	6·32	15·19	3·15	5·37	5·63	93
13·34	5	P 190	0·77	1·29	1·53	3·69	0·87	3·63	6·56	6·78	6·22	5·87	11·70	2·78	5·08	4·37	72
Mean...			0·97	2·76	4·96	6·77	2·10	4·58	11·72	4·43	10·50	5·95	15·27	2·80	5·39	6·03	100
Standard Error			–	0·29	0·33	0·42	0·38	0·51	0·73	0·70	1·06	0·60	1·07	0·37	0·84	0·25	4
Significant Difference			–	1·55 (P=·001)	0·96 (P=·05)	1·24 (P=·05)	1·12 (P=·05)	–	2·17 (P=·05)	2·06 (P=·05)	3·11 (P=·05)	–	3·16 (P=·05)	1·10 (P=·05)	–	0·73	12

*Using actual out-turn. †Using random sample.

EXPERIMENT II.—LATIN SQUARE II.—PLANTED OCTOBER, 1938—SINGLE STEM

SUMMARY OF RESULTS FOR 1942–53

Yields calculated as cwts. of clean coffee per acre

PARENT														Mean of 12 years 1942–53	
Mean Yield	No. of years recorded	Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	†1953	Cwts.	Percentages
15·04	4	H 133	1·56	4·67	4·57	1·45	3·18	13·37	1·98	12·11	9·07	20·16	2·27	5·49	6·64	98
11·44	8	L 1	1·13	4·86	4·42	2·05	3·52	14·42	4·45	12·92	9·87	23·34	2·70	10·02	7·81	116
9·39	7	F 839	1·11	4·78	5·39	3·91	2·38	15·38	3·70	13·03	8·00	22·81	4·51	7·96	7·75	115
16·83	7	N 39	0·93	3·09	3·35	3·46	3·04	12·86	6·48	7·99	12·48	21·27	6·59	8·29	7·48	111
13·17	5	P 147	0·76	2·78	4·28	0·88	3·29	10·17	5·02	9·21	7·21	16·18	3·88	4·81	5·70	84
7·50	7	E 59	0·69	2·04	3·94	0·88	3·20	8·62	5·74	7·04	5·88	17·02	2·61	4·19	5·16	76
Mean			1·03	3·71	4·29	2·10	3·10	12·47	4·56	10·38	8·75	20·13	3·76	6·79	6·75	100
Standard Error			0·27	0·37	0·24	0·33	0·44	0·69	0·73	0·65	0·67	1·11	0·43	0·87	0·23	3
Significant Difference (P=·05) ...			–	1·08	0·70	0·99	–	2·02	2·22	1·91	1·98	3·26	1·26	2·55	0·67	10

*Using actual out-turn. †Using random sample

EXPERIMENT II.—LATIN SQUARE III.—PLANTED OCTOBER, 1938—SINGLE STEM

SUMMARY OF RESULTS FOR 1942–53

Yields calculated as cwts. of clean coffee per acre

PARENT				1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	†1953	Mean of 12 years 1942–1953	
Mean Yield	No. of years recorded	Selection														Cwts.	Percentages
15·07 ...	4	H	1	1·34	4·85	8·36	3·64	1·82	15·78	7·55	14·67	11·10	26·32	6·19	4·95	8·88	119
8·75 ...	7	F	840	0·90	4·57	7·87	3·65	3·44	15·96	4·33	14·80	10·33	25·56	5·32	4·09	8·40	113
11·88 ...	5	P	313	3·13	4·13	5·87	0·75	2·29	11·24	1·26	14·83	6·42	22·23	0·72	5·94	6·58	88
13·75 ...	7	N	69	1·83	5·42	5·06	1·53	3·37	11·89	1·62	17·45	7·32	29·00	1·31	8·90	7·89	106
15·20 ...	7	N	50	1·54	4·77	4·55	1·08	2·61	10·81	1·45	15·55	6·25	23·68	1·11	8·52	6·83	92
6·57 ...	7	E	665	1·40	2·44	4·24	0·55	2·78	8·51	3·64	12·08	5·99	21·80	2·18	7·94	6·13	82
Mean		...	...	1·69	4·39	5·99	1·87	2·72	12·37	3·31	14·90	7·90	24·76	2·80	6·73	7·45	100
Standard Error ...		...	...	0·26	0·33	0·44	0·37	0·45	1·07	0·45	1·05	0·94	1·51	0·31	1·12	0·35	5
Significant Difference		...	...	1·39 (P=·001)	0·96 (P=·05)	1·30 (P=·05)	1·08 (P=·05)	–	3·14 (P=·05)	1·34 (P=·05)	3·09 (P=·05)	2·78 (P=·05)	4·46 (P=·05)	0·90 (P=·05)	3·31 (P=·05)	1·04 (P=·05)	14 –

*Using actual out-turn. †Using random sample.

EXPERIMENT II.—LATIN SQUARE IV.—PLANTED 1939—SINGLE STEM

SUMMARY OF RESULTS FOR 1942–53

Yields calculated as cwts. of clean coffee per acre

PARENT		Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	†1953	Mean of 12 years 1942–53	
Mean Yield	No. of years recorded														Cwts.	Percentages
11·23	7	N 81	0·94	1·56	2·78	0·01	1·28	6·60	1·29	9·08	7·28	18·45	0·48	2·52	4·36	82
16·83	7	N 39	0·05	0·61	1·81	0·09	0·62	6·52	2·79	9·65	6·37	23·85	0·67	3·62	4·72	89
11·44	8	L 1	0·75	1·65	3·53	0·12	1·59	10·27	1·52	11·28	6·44	19·08	0·26	2·30	4·90	92
15·07	4	H 1	0·81	3·78	6·23	2·16	0·88	13·41	6·71	10·39	10·94	24·77	1·93	3·83	7·14	134
13·88	7	N 197	0·55	2·19	3·37	0·12	2·61	10·51	2·70	13·30	9·20	23·46	0·95	4·43	6·11	115
18·38	7	R 3	0·98	2·16	2·39	0·04	1·34	7·35	1·11	10·51	5·63	21·08	0·33	3·84	4·73	89
Mean			0·68	1·91	3·35	0·42	1·39	9·11	2·69	10·70	7·64	21·78	0·77	3·42	5·32	100
Standard Error			0·08	0·17	0·25	–	0·26	0·71	0·62	0·91	0·76	1·49	0·19	0·45	0·31	6
Significant Difference			0·44 (P=·001)	0·50 (P=·05)	0·74 (P=·05)		0·77 (P=·05)	2·10 (P=·05)	1·81 (P=·05)	2·69 (P=·05)	2·24 (P=·05)	4·38 (P=·05)	0·56 (P=·05)	1·34 (P=·05)	0·90 (P=·05)	17

*Using actual out-turn. †Using random sample.

EXPERIMENT II.—RANDOMIZED BLOCK I.—PLANTED APRIL, 1939—SINGLE STEM

SUMMARY OF RESULTS FOR 1942–53 CROP

Yields calculated as cwts. of clean coffee per acre

PARENT															
Mean Yield	No. of years recorded	Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	†1953	Mean of 12 years 1942–53
															Cwts. / Percentages
11·71	7	R 11	0·83	Crop Failed	Crop Failed	1·95	1·17	9·65	2·07	16·20	5·37	22·83	0·25	6·87	5·71 / 89
14·02	7	R 2	0·65			1·68	1·32	9·51	3·09	16·80	6·98	20·48	0·85	5·75	5·69 / 89
14·49	4	H 61	0·72			5·94	1·21	13·93	8·99	16·62	7·77	31·75	3·30	11·05	8·58 / 134
Unrecorded		R.R.H.—vigorous	0·87			4·10	1·74	14·27	5·90	15·31	9·39	23·67	3·23	10·35	7·55 / 118
24·22	7	R 13	0·82			1·86	1·34	11·71	4·33	15·71	8·71	21·21	0·55	8·50	6·38 / 100
15·04	4	H 133	0·91			1·87	1·32	11·49	3·76	17·30	8·28	24·81	0·62	6·58	6·57 / 103
10·81	6	J 104	0·80			1·51	1·44	10·38	4·00	16·66	6·13	22·13	0·39	5·72	5·91 / 92
12·13	7	N 106	0·55			1·36	1·24	9·42	3·38	15·54	6·50	21·15	0·21	5·96	5·55 / 87
14·55	7	N 5	0·46			1·47	0·70	7·81	5·49	11·68	9·37	22·53	0·92	6·52	5·64 / 88
Mean			0·74			2·42	1·27	10·90	4·56	15·76	7·61	23·39	1·15	7·48	6·40 / 100
Standard Error			0·12			0·41	0·21	0·71	0·78	0·98	0·84	1·27	0·38	0·97	0·24 / 4
Significant Difference			0·21 (P=·02)			1·18 (P=·05)	–	2·03 (P=·05)	2·24 (P=·05)	2·80 (P=·05)	2·40 (P=·05)	3·62 (P=·05)	1·08 (P=·05)	2·76 (P=·05)	0·68 (P=·05) / 11

*Using actual out-turn. †Using random sample.

EXPERIMENT II.—RANDOMIZED BLOCK II.—PLANTED APRIL, 1939—SINGLE STEM

SUMMARY OF RESULTS FOR 1942–53 CROP

Yields calculated as cwts. of clean coffee per acre

PARENT		Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	*1952	†1953	Mean of 12 years 1942–53	
Mean Yield	No. of years recorded														Cwts.	Percentages
13·58	7	N 100	1·27	Crop Failed	Crop Failed	0·55	Crop Failed	10·11	1·50	13·46	6·22	18·90	0·40	7·25	5·27	107
13·59	7	N 217	0·58			0·59		9·38	1·74	13·76	8·03	14·63	0·44	5·75	4·90	100
13·93	7	R 1	1·13			0·48		9·15	2·11	12·99	6·73	16·08	0·56	5·73	4·89	100
12·63	7	N 229	0·89			0·35		7·79	1·51	14·37	7·23	14·99	0·43	5·41	4·69	96
15·19	7	N 34	1·24			0·45		9·33	1·54	12·22	5·99	15·98	0·33	3·44	4·42	90
7·69	7	E 325	0·52			0·63		6·87	4·27	11·00	7·58	16·73	0·62	5·65	4·72	96
12·76	7	N 182	0·83			0·62		6·88	4·49	11·65	8·79	21·68	0·52	5·25	5·26	107
14·08	7	N 215	1·03			0·49		8·06	2·44	11·90	6·88	16·61	0·45	4·99	4·66	95
12·41	6	J 49	1·37			0·64		10·26	1·63	16·20	5·80	18·75	0·25	5·74	5·38	110
Mean			1·10			0·53		8·64	2·36	13·06	7·03	17·15	0·44	5·47	4·91	100
Standard Error			0·17			–		0·77	0·54	0·86	0·87	1·05	0·13	0·92	0·25	5
Significant Difference (P=·05)			0·53			–		2·22	1·53	2·47	–	3·00	–	–	–	–

*Using actual out-turn. †Using random sample.

KENTS PLOT SELECTIONS—SINGLE STEM

Yields calculated as cwts. of clean coffee per acre

Tree No.	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1938–53
	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	Actual	Actual	16%	Actual	Actual	Actual	Mean
KP. 146 ...	25·14	15·36	31·23	7·98	12·90	12·05	17·06	3·82	1·70	11·63	15·31	2·72	2·89	6·06	T	1·17	10·44
KP. 147 ...	28·17	3·75	8·23	11·29	1·53	10·78	7·72	12·90	T	6·45	1·26	7·14	4·50	5·43	1·27	1·27	6·98
KP. 151 ...	8·60	12·11	7·38	8·06	1·36	3·73	12·30	7·38	4·92	8·99	9·03	8·83	4·33	9·82	2·55	2·65	7·00
KP. 154 ...	12·71	17·74	9·33	13·75	0·59	12·30	2·38	11·46	1·10	22·15	30·56	3·78	23·59	3·31	7·64	5·30	11·11
KP. 162 ...	10·95	24·66	20·03	0·68	16·12	STUMPED		0·17	0·08	2·38	4·79	0·94	4·67	1·69	1·91	2·23	5·71
KP. 163 ...	19·43	22·34	10·95	5·77	13·58	13·24	17·06	3·31	3·82	16·80	13·56	10·67	10·69	13·83	5·41	11·99	12·03
KP. 164 ...	9·20	12·28	6·45	5·77	5·01	5·52	17·65	3·22	8·32	25·88	31·04	13·82	31·40	10·47	14·21	21·43	13·85
KP. 176 ...	9·33	12·33	15·95	9·08	0·59	2·21	8·74	0·17	4·33	9·08	4·66	7·22	6·36	7·98	0·53	1·70	6·27
KP. 204 ...	8·01	14·70	7·81	16·12	1·78	10·78	10·95	10·01	14·68	18·24	3·71	22·24	0·34	8·57	6·05	8·49	10·16
KP. 214 ...	6·79	28·17	1·27	11·63	6·36	5·86	5·60	–	0·59	5·18	–	8·89	3·39	4·84	0·21	3·29	5·75
KP. 215 ...	3·25	30·35	8·66	6·11	5·09	13·15	28·43	6·28	14·68	21·81	4·78	26·28	5·01	12·10	2·65	16·23	12·80
KP. 218 ...	8·26	27·05	6·87	1·78	3·82	9·08	13·24	3·31	8·49	13·24	3·91	22·82	5·43	8·89	5·41	3·92	9·10
KP. 226 ...	7·10	27·43	6·19	10·95	–	6·70	6·79	1·78	3·56	4·67	7·86	2·94	5·94	0·75	4·14	8·17	6·56
KP. 227 ...	11·90	22·49	16·29	17·48	0·93	12·81	12·64	T	4·92	16·55	0·29	13·42	10·27	4·08	4·56	6·89	9·72
KP. 228 ...	13·39	25·35	7·81	8·15	0·85	8·74	7·72	5·69	6·19	13·49	1·70	16·11	5·86	6·60	2·86	6·68	8·57
KP. 231 ...	14·37	16·86	25·20	1·02	3·31	11·37	19·26	4·58	5·60	17·23	14·29	24·16	9·33	18·39	2·86	1·38	11·83
KP. 260 ...	7·84	12·87	8·32	11·96	2·80	10·52	12·64	11·71	9·25	22·83	1·60	33·76	2·38	18·04	5·52	10·08	11·38
KP. 261 ...	9·57	11·54	10·01	3·39	2·72	7·21	10·78	6·28	7·81	7·64	12·26	5·71	10·52	1·34	9·12	1·91	7·36
KP. 262 ...	11·20	14·43	12·13	11·63	0·42	20·79	7·64	15·10	10·61	16·97	1·78	8·36	9·16	12·51	7·8›	5·30	10·37
KP. 263 ...	10·98	19·46	7·01	16·38	1·02	12·13	10·86	4·07	6·79	8·49	5·94	8·79	8·49	9·02	6·89	9·12	9·09
KP. 265 ...	13·10	14·62	9·33	9·33	3·31	19·86	13·92	7·64	18·16	14·60	20·13	9·88	23·93	5·67	9·65	10·71	12·74
KP. 266 ...	9·90	10·95	8·57	5·43	0·34	6·45	12·47	3·48	17·74	6·53	14·78	5·13	16·97	1·87	5·41	7·00	8·31
KP. 281 ...	8·25	12·24	7·72	0·08	0·76	11·80	15·19	0·93	4·92	2·72	6·92	20·50	17·57	8·62	4·14	7·11	8·09
KP. 285 ...	9·42	12·30	6·87	18·75	1·53	16·46	15·10	3·14	14·51	9·50	12·39	15·50	19·77	3·84	13·68	12·30	11·57
KP. 289 ...	8·35	11·83	10·10	13·41	0·17	13·58	13·15	3·48	7·64	21·38	2·68	19·11	3·31	14·13	5·73	11·99	10·00
KP. 352 ...	9·05	22·01	0·68	14·17	–	11·63	6·96	4·92	6·02	11·12	18·05	10·65	20·79	14·55	11·46	21·00	11·44
KP. 362 ...	7·41	13·10	11·12	19·52	3·73	15·78	3·90	11·29	3·65	15·02	22·79	7·01	22·49	3·73	20·58	5·30	11·65
KP. 405 ...	6·74	14·70	2·46	2·80	2·72	12·13	15·02	5·26	10·10	17·23	28·80	18·00	24·52	8·67	14·00	40·94	14·01
KP. 406 ...	9·62	10·93	9·33	4·16	4·33	14·93	14·09	6·87	10·78	11·37	28·49	14·80	19·09	8·37	9·76	29·17	12·88
KP. 409 ...	9·88	13·88	5·35	9·25	3·99	18·16	10·44	8·83	11·80	10·78	19·39	11·88	23·17	5·53	8·80	24·82	12·25
KP. 412 ...	10·01	13·69	7·64	13·58	2·80	9·84	7·89	8·57	2·63	12·81	12·61	13·39	18·67	6·37	8·38	31·18	11·25
KP. 414 ...	10·52	11·76	7·02	6·62	1·78	10·61	6·70	6·45	7·38	8·74	24·77	7·83	23·76	1·73	6·05	25·88	10·48
KP. 423 ...	10·49	14·15	10·95	17·99	5·94	29·62	3·99	20·03	7·55	29·02	8·16	19·35	4·84	23·54	11·77	9·12	14·16
KP. 466 ...	8·68	12·36	6·78	14·51	0·34	15·10	8·32	9·08	1·19	14·51	12·38	22·93	10·01	9·06	11·77	18·24	10·95
KP. 512 ...	10·27	11·15	2·89	15·78	2·12	15·78	10·36	7·04	6·62	9·25	18·16	22·08	6·36	12·47	0·11	0·42	9·43
KP. 518 ...	5·74	14·87	2·29	13·07	3·99	10·52	10·18	6·70	1·78	8·57	8·68	2·70	14·34	3·17	7·11	4·35	7·38
KP. 532 ...	8·51	12·51	9·50	19·52	3·14	13·92	11·96	1·10	4·75	15·53	20·47	14·38	15·44	1·10	7·32	26·94	11·63
KP. 683 ...	18·35	12·47	6·62	15·61	2·04	16·29	4·24	14·93	0·51	9·25	11·36	15·67	12·30	17·51	0·95	18·99	11·07
KP. 685 ...	11·56	12·83	6·11	11·96	0·85	12·98	6·53	15·95	3·39	15·02	10·63	24·47	10·18	20·69	1·27	21·85	11·64
VC. 276 ...	7·41	14·19	14·85	6·70	8·32	8·83	9·08	4·07	9·59	7·13	16·62	2·27	13·75	–	–	–	–
VC. 363 ...	7·64	14·91	5·60	9·50	12·47	12·73	0·59	13·32	5·35	3·31	15·96	0·08	10·95	–	–	–	–
VC. 364 ...	6·93	14·90	8·40	8·49	13·49	6·28	0·34	14·09	6·02	7·89	21·91	1·20	6·02	–	–	–	–

EXPERIMENT I—SELECTIONS

Yields calculated as cwts. of clean coffee per acre

Tree No.	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1938–53
	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	Actual	Actual	Actual	Actual	Actual	Actual	Mean
11	8·99	4·56	7·81	21·30	8·23	33·35	–	41·66	0·85	26·39	10·37	10·35	–	4·54	3·50	0·42	11·40
33	4·41	13·85	3·56	22·15	6·53	25·71	–	54·05	–	29·11	43·09	11·21	14·13	17·27	1·17	5·62	15·74
55	14·09	3·79	13·92	13·24	9·84	23·59	–	38·27	2·04	49·73	1·28	25·08	2·34	19·27	–	0·32	13·55
71	14·17	1·64	10·61	21·55	16·63	23·93	1·19	44·89	0·51	42·26	1·15	20·04	1·17	19·59	2·02	6·58	14·25
179	13·32	2·04	6·53	21·30	2·12	37·75	3·05	39·03	–	25·03	1·47	6·88	1·29	6·65	–	T	10·40
188	15·51	–	10·27	15·02	11·96	17·14	1·27	44·21	0·59	45·06	5·71	24·94	0·88	17·38	1·91	1·38	13·33
197	13·72	1·36	10·86	14·43	7·21	21·64	8·74	50·26	0·59	27·24	20·80	13·43	3·17	15·87	0·11	T	13·09
200	13·88	0·08	9·25	13·41	12·98	26·98	–	45·40	–	38·36	3·39	24·22	0·82	17·45	–	T	12·89
255	13·85	–	10·52	19·86	3·05	19·77	–	49·90	–	41·24	4·14	29·25	2·52	18·66	5·09	1·80	13·73
339	16·97	0·17	13·24	7·81	11·96	27·83	–	42·85	1·95	34·54	17·35	22·38	2·17	15·86	–	0·21	13·46
448	15·24	1·10	14·60	10·10	5·18	26·48	–	46·16	6·70	46·08	1·65	31·55	T	15·04	0·21	T	13·76

T=Trace.

EXPERIMENT III.—CLONES v. SEEDLINGS—PLANTED 1938

This experiment was originally designed to compare clones (rooted cuttings) with seedlings of the same parent, both by themselves and as root-stocks grafted with scions from another single mother-tree. The trees are pruned on the single stem system and the area is lightly shaded with *Albizzia maranguensis*. Although planted in 1938 (as a 4 x 4 latin square) difficulties regarding the technique of grafting in the field were experienced. The advent of the war, and consequent shortage of staff, aggravated the position, and even now there are a number of missing trees. In an endeavour to obtain further evidence regarding the respective merits of rooted cuttings and seedlings of the same parents (cf. Experiment IIIA below), it was decided to commence recording the yields of this experiment in 1948. Ten mother-trees are represented. Due allowance has been made in the analysis for the missing trees. Individual tree yields have been recorded since 1950.

EXPERIMENT III:—ANNUAL AND MEAN YIELDS FOR 6 YEARS, 1948–53, EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	*1948	*1949	*1950	*1951	*1952	†1953	Mean of 6 years 1948–53
Clones	8·83	15·75	9·09	14·37	2·00	6·94	9·09
Seedlings	12·16	16·12	12·80	15·08	2·98	8·82	11·26
Mean	10·50	15·94	10·94	14·73	2·49	7·88	10·18
Standard Error	1·80	1·87	1·63	1·74	0·30	0·89	0·05
Significant Difference	–	–	–	–	–	–	0·97 (P=·001)

*Using actual out-turn. †Using random sample.

Seedlings have given a significantly higher yield than clones in this Experiment.

EXPERIMENT IIIA.—CLONES v. SEEDLINGS—PLANTED 1942

This is designed to give a straight comparison between clones (rooted cuttings) and seedling progeny of the same mother-trees; the experiment is laid out as randomized blocks repeated ten times; the trees are pruned on the single stem system. Shade is afforded by *Albizzia stipulata* and *Maesopsis eminii*, with *Albizzia maranguensis* as the permanent shade tree. As in Experiment III there were a number of missing trees for which allowance has been made in the analysis. This correction is for differences in numbers only. The records of this experiment were kept by plots up to 1949. Individual tree yields have been recorded since 1950. Nine mother-trees are represented.

EXPERIMENT IIIA.—ANNUAL AND MEAN YIELDS FOR THE 9 YEARS 1945–53 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	1945 16%	1946	*1947	*1948	*1949	*1950	*1951	*1952	†1953	Mean of 9 years 1945–53
										Cwts.
Clones	3·17	Crop Failed	5·45	8·48	10·91	13·11	12·84	3·33	11·61	7·45
Seedlings ...	2·06		4·66	9·44	9·43	14·69	10·29	4·61	11·47	7·39
Mean	2·62		5·06	8·96	10·17	13·90	11·56	3·97	11·55	7·42
Standard Error ...	0·23		0·17	0·46	0·53	0·90	0·80	0·27	0·88	0·22
Significant Difference ...	0·75		0·55	–	–	–	–	0·87	–	–

*Using actual out-turn. †Using random sample.

For the 9-year period there is no significant difference in yield.

EXPERIMENT IIIB

This experiment is designed to test four methods of multiplication of coffee. It is laid out in randomized blocks repeated six times. Plots are split to test three selections, and their interaction with the main treatments.

The experiment was planted in April, 1951.

MAIN TREATMENTS:

A=Clone.
B=Seedling of original parent.
C=Seedling of clone.
D=Second generation seedling.

SUB-TREATMENTS (SELECTIONS):

N. 39.
N. 5.
H. 66.

EXPERIMENT IIIB—1953 CROP YIELDS CALCULATED AS CWTS. OF CLEAN COFFEE PER ACRE

	A	B	C	D	Selection MEAN
N 39	12·40	8·52	7·41	6·43	8·69
H 66	12·17	8·50	7·19	5·86	8·43
N 5	9·95	6·58	6·46	7·64	7·65
Treatment Mean	11·51	7·87	7·02	6·65	8·26

Standard Error for selections 0·30.
Standard Error for Treatments 0·22.
Significant Difference for Treatments 0·65.

EXPERIMENT IA

In this experiment the object is to investigate the possibilities of using pasture grass mowings as mulch for coffee. The grass used in *Cynodon plectostachyum* at two levels of application, and yields of coffee so mulched are compared with coffee mulched with guinea grass at two levels and with coffee to which farmyard manure at the rate of 35 lb. per tree is applied.

This experiment is laid out on Kents coffee which was planted in 1935.

TREATMENTS:

A=Cynodon Mulch 20 lb. per tree.
B=Cynodon Mulch 40 lb. per tree.
C=Guinea Grass 20 lb. per tree.
D=Guinea Grass 40 lb. per tree.
E=Farmyard manure 1 *debe* (petrol tin) per tree.
F=Control.

Treatments were first applied in August, 1951.

EXPERIMENT IA

ANNUAL AND MEAN YIELDS FOR THE YEARS 1952–53 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	1952	1953	Mean of 2 years 1952–1953	
			Cwts.	Percentages
A	0·75	3·04	1·90	75
B	1·02	3·30	2·16	85
C	2·41	4·28	3·34	131
D	1·52	3·65	2·58	101
E	2·11	3·97	3·04	119
F	1·89	2·64	2·26	89
Mean	1·62	3·48	2·55	100
Standard Error ...	0·68	0·74	0·49	19·2

EXPERIMENT V.—MULCH, COMPOST AND NITROGEN—PLANTED 1940

This is a partially confounded 3 x 3 x 3 factorial experiment designed to determine the effects on yield of mulch, compost, and sulphate of ammonia at three quantity levels separately and in all combinations. The material used for mulching is dried elephant grass. The area is unshaded; the trees, which are unselected clonal material, are pruned on the single stem system.

Treatments (per tree):

Mulch : M0 = Nil.
M1 = 40 lb. dried elephant grass.
M2 = 80 lb. dried elephant grass.

Compost : C0 = Nil.
C1 = 1 *debe* (petrol tin) compost.
C2 = 2 *debes* (petrol tin) compost.

		1940–42	1943–45	1946–53
Nitrogen :	N0 =	Nil	Nil	Nil
	N1 =	1 oz. sulphate of ammonia.	2 oz. sulphate of ammonia.	3 oz. sulphate of ammonia.
	N2 =	2 oz. sulphate of ammonia.	4 oz. sulphate of ammonia.	6 oz. sulphate of ammonia.

In 1952 the mulch was applied just prior to the long rains, in previous years it was applied after these rains. Compost was applied prior to the rains, and lightly forked in, as in previous years; the application of sulphate of ammonia was made as in previous years, i.e. in May, after approximately 15 inches of rain.

It is not considered that any additional information will be obtained from this experiment and the treatments will not be applied in 1954. Records of yields of the individual plots will be taken in order to assess residual effects.

The annual yields and also the summary for the years 1942–53 are given below.

EXPERIMENT V.—MEAN YIELD FOR 12 YEARS 1942–53 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	N0			N1			N2		
	C0	C1	C2	C0	C1	C2	C0	C1	C2
M0	7·93	9·39	9·63	9·24	9·60	9·84	9·28	8·94	9·72
M1	8·32	9·57	9·79	9·26	8·72	9·46	8·37	9·73	9·26
M2	9·18	8·91	9·21	8·61	8·87	8·40	8·11	9·18	8·70

EXPERIMENT V—MULCH AND COMPOST

	C0	C1	C2	Mean
M0 ...	8·82	9·31	9·73	9·29
M1 ...	8·65	9·34	9·50	9·17
M2 ...	8·63	8·99	8·77	8·80

Standard Error for marginal means ± 0·14.
Significant Difference for marginal means ± 0·40.
Standard Error for the body of table ± 0·24.

EXPERIMENT V—MULCH AND NITROGEN

	N0	N1	N2	Mean
M0 ...	8·99	9·56	9·32	9·29
M1 ...	9·23	9·15	9·12	9·17
M2 ...	9·10	8·63	8·65	8·80
Mean ...	9·10	9·11	9·03	9·09

Standard Error for marginal means ± 0·14.
Significant Difference for marginal means ± 0·40.
Standard Error for the body of table ± 0·24.

EXPERIMENT V—COMPOST AND NITROGEN

	N0	N1	N2	Mean
C0	8·49	9·04	8·58	8·70
C1	9·30	9·06	9·28	9·21
C2	9·55	9·24	9·23	9·33
Mean ...	9·10	9·11	9·03	9·09

Standard Error for marginal means ± 0·14.
Significant Difference for marginal means ± 0·40.
Standard Error for the body of table ± 0·24.

EXPERIMENT V.—PLOT YIELDS EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

Mulch	Compost	Nitrogen	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	Mean 1942–53
0	0	0	1·26	0·29	0·45	11·23		7·39	22·75	7·14	18·04	10·62	11·33	4·76	7·93
0	0	1	1·28	0·55	0·58	11·49		9·27	25·17	8·57	21·22	11·55	14·40	6·81	9·24
0	0	2	1·00	0·36	0·92	13·65		11·54	21·57	13·39	14·85	14·32	14·25	5·55	9·28
0	1	0	1·46	0·54	0·95	17·18		12·98	22·39	11·32	18·10	11·34	12·36	4·06	9·39
0	1	1	1·42	0·51	1·17	14·21		15·14	17·79	15·15	16·02	13·16	14·69	5·96	9·60
0	1	2	1·35	0·46	0·65	10·39		11·48	19·06	15·34	16·83	12·04	14·95	5·04	8·94
0	2	0	1·71	0·68	1·03	17·61		10·58	24·69	11·62	18·37	8·14	14·56	6·60	9·63
0	2	1	1·32	0·37	1·16	14·16		12·95	20·09	13·71	17·32	13·78	16·10	7·25	9·84
0	2	2	0·42	0·36	0·64	13·29		11·92	17·09	16·02	16·55	16·77	14·88	8·36	9·72
1	0	0	1·85	0·49	0·88	15·27		8·89	24·76	9·61	14·12	10·10	10·39	3·43	8·32
1	0	1	1·51	0·59	1·43	14·32		11·30	21·01	11·90	16·71	16·28	10·54	5·55	9·26
1	0	2	1·48	0·39	1·20	12·83		10·42	17·30	12·67	14·67	12·73	12·11	4·36	8·37
1	1	0	2·31	0·60	0·97	15·84		12·95	20·41	16·09	16·25	14·09	12·27	3·30	9·57
1	1	1	2·18	0·78	0·82	13·15		10·00	20·83	12·13	16·47	11·40	12·60	4·39	8·72
1	1	2	1·42	0·46	1·43	16·17		13·13	22·44	14·81	14·99	13·56	13·85	4·38	9·73
1	2	0	1·99	0·64	1·49	13·53		15·86	17·45	14·65	18·22	13·96	14·02	5·60	9·79
1	2	1	1·52	0·47	0·70	13·01		15·14	16·49	15·15	17·49	14·43	13·97	5·21	9·46
1	2	2	1·65	0·57	1·04	12·18		10·63	22·38	11·91	18·58	12·26	14·83	5·45	9·26
2	0	0	1·86	0·52	1·01	14·09		14·51	20·91	14·42	14·04	12·29	12·37	4·27	9·18
2	0	1	1·65	0·56	1·28	13·52		12·22	20·17	14·11	12·86	12·41	10·67	4·07	8·61
2	0	2	1·38	0·31	0·87	9·47		9·70	19·14	14·18	12·31	14·00	10·06	6·01	8·11
2	1	0	1·24	0·51	1·15	13·34		10·48	20·81	14·16	15·02	12·51	13·07	4·76	8·91
2	1	1	1·64	0·31	0·76	14·41		14·09	17·81	13·14	12·29	15·88	11·23	4·88	8·87
2	1	2	1·56	0·17	0·92	15·30		12·80	17·41	14·63	15·71	11·62	14·36	5·26	9·18
2	2	0	1·38	0·54	1·24	14·06		11·96	18·82	13·61	18·18	11·11	14·38	5·28	9·21
2	2	1	1·66	0·61	1·07	10·01		10·81	22·81	10·92	16·05	10·77	10·75	5·12	8·40
2	2	2	1·67	0·53	1·04	12·96		13·30	16·93	14·30	14·56	12·85	12·44	3·53	8·70

Crop Failed

EXPERIMENT XV.—IRRIGATION AND MULCH—PLANTED 1940

This is a complex confounded factorial experiment laid out as an 8 × 8 quasi-latin square. It is designed to investigate the effects of irrigation and mulch, both separately and in combination, on coffee culture. The material used for mulching is dried banana trash. The experiment is planted with four different clones, from unselected mother-trees, and the behaviour of these clones is also recorded. They are pruned on the single stem system. The area is unshaded.

The treatments were modified as from July, 1951, since then it has been considered observation plot only but yields have been recorded.

Treatments:	1940 to June, 1951	July, 1951 onwards
Irrigation:		
0 =	Nil	0 = As before.
1 =	Made up to 2 inches of effective rainfall monthly	1 = As before.
2 =	Made up to 4 inches of effective rainfall monthly	2 = 1 inch monthly.
3 =	Made up to 2 inches of effective rainfall fortnightly	3 = 2 inches from September to March inclusive.
Mulch:		
0 =	Nil	0 = As before.
1 =	Banana trash 40 lb. per tree at end of long rains	1 = As before.
2 =	Banana trash 80 lb. per tree at end of long rains	2 = 20 lb. in June.
3 =	Banana trash 40 lb. per tree at end of both long and short rains	3 = 20 lb. in June and December.

Clone:

1 = KIL 50
2 = KIL 98
3 = KIL 48
4 = KIL 10

The annual yields for the various treatments are given below, together with the summary for the years 1942–51 and the yields for 1952 and 1953.

EXPERIMENT XV.—PLOT YIELDS

Annual Yields expressed as cwts. of Clean Coffee per Acre

Irrigation	Mulch	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	Mean 1942–51	1952	1953
0	0	0·38	2·22	0·05	2·61	0·30	2·19	15·47	4·26	11·67	7·31	4·57	7·95	2·61
0	1	1·42	5·76	1·72	1·97	1·21	8·31	20·81	8·88	14·39	7·90	7·24	10·26	6·84
0	2	1·61	6·11	1·88	1·21	0·44	8·28	21·14	7·93	14·86	8·41	7·21	9·35	7·31
0	3	1·35	5·53	2·67	1·10	0·70	7·48	17·29	9·48	13·76	6·86	6·60	10·75	4·47
1	0	0·66	4·95	2·55	1·54	3·42	12·43	12·33	15·00	7·33	9·04	6·93	9·53	3·04
1	1	1·80	8·29	2·99	0·86	4·33	17·76	16·63	18·79	8·31	9·19	8·89	11·82	5·88
1	2	2·03	9·32	2·87	1·80	1·95	14·65	16·97	14·22	7·87	9·08	8·06	8.47	6·17
1	3	1·76	7·97	3·24	1·34	4·20	16·69	15·75	15·20	9·85	8·90	8·51	11·46	4·58
2	0	0·86	6·46	2·94	1·56	3·75	12·54	11·06	18·05	4·92	9·55	7·20	7·23	4·61
2	1	1·72	9·57	3·26	1·04	3·68	15·10	14·29	18·10	6·84	10·79	8·44	12·74	6·56
2	2	2·43	7·94	2·33	0·97	3·00	15·10	16·25	16·17	6·61	9·98	8·08	12·27	6·54
2	3	1·70	6·87	3·46	1·17	3·14	15·21	17·32	13·76	7·92	9·84	8·05	11·27	6·04
3	0	1·10	5·11	2·85	1·07	1·92	12·55	8·39	16·04	5·58	5·69	6·10	5·92	2·67
3	1	1·96	7·44	2·76	0·20	3·85	17·97	14·25	15·05	10·58	8·31	8·39	13·03	5·87
3	2	2·22	7·02	4·27	0·54	3·42	18·08	15·37	16·12	9·20	9·03	8·52	11·92	9·17
3	3	1·59	5·75	4·08	0·70	2·96	17·40	15·39	12·87	8·78	8·46	7·80	10·89	7·29

Since 1952 this area has been treated as an observation plot.

EXPERIMENT XIX

This experiment was planted in 1949 with the object of comparing the yields on multiple stem both with and without interplanted bananas and with and without manure. It is laid out as a randomized block repeated eight times. Each block is planted with a different selection.

TREATMENTS :

A=No bananas.

B=As A plus 1 *debe* (petrol tin) of manure per tree.

C=As A plus 2 *debes* (petrol tin) of manure per tree.

D=Bananas interplanted at 90 stools per acre.

E=As D plus 1 *debe* (petrol tin) of manure per tree.

F=As D plus 2 *debes* (petrol tin) of manure per tree.

G=Bananas interplanted at 135 stools per acre.

H=As G plus 1 *debe* (petrol tin) of manure per tree.

I=As G plus 2 *debes* (petrol tin) of manure per tree.

EXPERIMENT XIX

ANNUAL AND MEAN YIELDS FOR THE YEARS 1952–1953, EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

TREATMENTS

	1952	1953	Mean of 2 years 1952–1953	
			Cwts.	Percentages
A	4·83	9·92	7·38	128
B	7·10	11·62	9·36	163
C	5·10	9·96	7·53	131
D	1·88	6·96	4·42	77
E	2·34	9·52	5·93	103
F	2·45	8·20	5·33	93
G	1·34	6·68	4·01	70
H	1·13	7·00	4·06	70
I	1·16	6·43	3·80	66
Mean	3·04	8·48	5·76	100
Standard Error	0·68	0·67	0·54	9
Significant Difference (P=·05)	1·94	1·92	1·55	27

SELECTIONS

	1952	1953	Mean of 2 years 1952–1953	
			Cwts.	Percentages
KP 162	3·59	9·12	6·35	110
N 197	3·24	10·02	6·63	115
N 218	5·34	7·34	6·34	110
N 71	1·40	6·11	3·75	65
N 29	2·63	8·10	5·36	93
KIL 10	2·59	10·91	6·75	117
N 5	1·98	7·92	4·95	86
N 110	3·52	8·30	5·91	103
Mean	3·04	8·48	5·76	100
Standard Error	0·64	0·63	0·51	9
Significant Difference (P=·05)	1·83	1·81	1·46	25

EXPERIMENT XIII.—METHOD OF PRUNING—PLANTED DECEMBER, 1953

This experiment is laid out as 3 × 3 Latin Square, repeated three times in different parts of the Station. It is designed to compare three systems of pruning arabica coffee. Two of the replicates are lightly shaded with *Albizzia maranguensis*; the third is ushaded. The experiment is planted with seedling material.

Treatments:

S = Single stem.
M/3 = Multiple Stem — 3 suckers.
M/A = Multiple Stem — Agobiada — 3 suckers.

The yearly results, together with the summary, for the period 1938–1953 are shown below.

EXPERIMENT XIII

ANNUAL AND MEAN YIELDS FOR THE 16 YEARS 1938–53 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

		*1938	*1939	*1940	*1941	*1942	*1943	*1944	*1945	*1946	*1947	*1948	*1949	*1950	*1951	*1952	†1953	Mean of 16 years 1938–53	
Treatments:																		Cwts.	Per-cent-ages
Single stem	Fly Crop		1·982	2·996	7·290	3·951	5·318	5·319	9·389	1·04	20·492	9·318	15·052	12·362	15·81	11·35	13·38	8·34	91
Multiple stem, 3 suckers			2·348	11·928	12·962	12·034	17·238	5·677	7·079	2·30	29·578	5·056	12·701	13·446	16·24	10·01	13·53	10·77	117
Agobiada, Multiple stem, 3 suckers ...			0·407	6·607	6·370	7·494	13·079	4·992	8·028	0·90	17·329	10·987	13·840	7·272	16·53	10·20	11·93	8·45	92
Mean			1·579	7·177	8·874	7·840	11·878	5·329	8·232	1·41	22·467	8·454	13·864	10·745	16·19	10·52	12·95	9·18	100
Standard Error ...			0·301	0·493	0·700	0·401	0·843	0·127	1·013	0·312	0·410	0·764	0·552	2·108	1·11	0·78	1·01	0·24	3
Significant Difference (P=·05) ...			1·043	1·707	2·422	1·389	2·918	0·440	–	1·256	1·419	2·642	–	–	–	–	–	0·82	9

*Using actual out-turn. †Using random sample.

EXPERIMENT XX

This experiment is laid out as randomized blocks repeated six times. It is designed to study the effects of the time of pruning on coffee grown on the single stem system.

The coffee in which the experiment is being carried out consists of seedlings of both Kents and Bourbon, and was planted in 1936. It is well shaded by *Albizzia maranguensis* and *Rauvolfia inebrians*.

The treatments were commenced at the end of 1948.

TREATMENTS:

A. Pruned during month in which harvesting is completed.
B. Pruned one month later than A.
C. Pruned one month later than B.
D. Pruned one month later than C.
E. Pruned one month later than D.
F. Pruned one month later than E.

EXPERIMENT XX

ANNUAL AND MEAN YIELDS FOR THE YEARS 1949-53, EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	*1949	*1950	*1951	*1952	†1953	Mean of 4 years 1949–52	
						Cwts.	Percentage
A.—Pruned during month in which harvesting completed	12·93	8·79	17·61	6·88	16·59	12·56	121
B.	11·60	7·14	15·61	6·17	15·87	11·28	109
C.	9·53	8·67	11·71	6·87	12·07	9·77	94
D. Successive months	8·24	8·31	13·24	5·61	15·25	10·13	98
E.	8·85	5·44	12·69	5·77	16·96	9·94	96
F.	9·53	5·66	9·59	3·95	14·10	8·56	83
Mean	10·11	7·33	13·41	5·87	15·14	10·37	100
Standard Error	0·79	1·65	0·99	0·76	1·40	0·57	5
Significant Difference (P=·05)	2·30	—	2·89	—	—	1·67	16

*Using actual out-turn. †Using random sample.

EXPERIMENT XXI

This experiment is designed to compare two methods of establishing the single stem method of pruning with three methods of establishing the multiple stem system. The layout consists of a 5 x 5 Latin Square.

TREATMENTS—PLANTED APRIL, 1951:

A=Single Stem—capped at 21"—to be cappad thrice in all.
B=Single Stem—capped at 36"—to be capped twice in all.
C=Multiple Stem—capped at 21"—Three suckers from below 10".
D=Multiple Stem—One uncapped stem.
E=Multiple Stem—Two suckers from top node.

EXPERIMENT XXI—PLOT YIELDS FOR 1953 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	A	B	C	D	E	Mean	Standard Error	Significant Difference
Cwts. per acre ...	4·69	6·30	2·75	5·22	3·92	4·57	0·49	1·49
Percentage ...	103	138	60	114	86	100	10·7	32·6

QUALITY

The table below shows the distribution, by classes, of the sample of the selections submitted for liquoring for the period 1948 to 1953. The number of selections in each class is shown for the respective years.

Year	CLASSES										Total No. of Selections
	1		2		3		4		5		
	No.	%	No.	%	No.	%	No.	%	No.	%	
1948	41	54·7	27	36·0	7	9·3	–	–	–	–	75
1949	6	7·1	26	31·0	31	36·9	17	20·2	4	4·8	84
1950	22	27·8	36	45·6	20	25·3	1	1·3	–	–	79
1951	15	15·6	59	61·5	17	17·7	5	5·2	–	–	96
1952	15	15·6	39	40·6	34	35·4	8	8·3	–	–	96
1953	27	28·1	45	46·9	21	21·9	2	2·1	1	1·0	96

It is noteworthy that the majority have been in the first three classes each year.

QUALITY AND YIELD

The table shows the liquoring classifications attained by the fifteen highest yielding selections over a period of years.

Clone	Square	Variety	Pruning	CLASSES						Score per acre	YIELD	
				1	2	3	4	5	Total No. Years		CWT.	Years recorded
KP 423	III	KENTS	MULTIPLE	1	2	3	–	–	6	14	16·50	7
KP 162	XVII	KENTS	MULTIPLE	–	3	1	1	–	5	–	15·56	6
KP 532	X	KENTS	SINGLE	–	4	–	1	–	5	–	14·63	8
KP 162	XIII	KENTS	MULTIPLE	–	3	1	1	–	5	–	14·29	4
KP 154	III	KENTS	MULTIPLE	–	2	2	2	–	6	18	13·95	7
H 66	VIII	KENTS	SINGLE	–	2	2	1	–	5	–	13·77	9
X 321	XIII	KENTS	MULTIPLE	1	1	3	1	–	6	16	13·48	6
KP 227	XII	KENTS	MULTIPLE	1	2	2	1	–	6	15	13·29	6
KI 363	XI	KENTS	MULTIPLE	1	2	3	–	–	6	14	13·28	6
KP 163	XII	KENTS	MULTIPLE	2	3	–	1	–	6	12	12·87	6
N 197	X	BOURBON	SINGLE	2	3	1	–	–	6	11	12·72	8
KIL 10	XIV	KENTS	MULTIPLE	–	2	1	2	–	5	–	12·61	5
N 34	XVII	BOURBON	MULTIPLE	1	3	2	–	–	6	13	12·60	6
N 5	XI	BOURBON	MULTIPLE	1	3	2	–	–	6	13	12·51	6
N 205	IX	BOURBON	SINGLE	4	2	–	–	–	6	8	11·99	8

GRADES AND CLASSIFICATIONS OF THE 1953/54 CROP

Total estimated crop expressed as clean coffee 64·22 tons.
This total is made up as follows:—

	Parch. in tons		Clean in tons
Lots 1–2, 4–7 inclusive sent to Curing Works as No. 1	60·95	...	49·65
Lot 3 Experimental:			
(A) 2·99 No. 1 Parch.	2·99	...	2·47
(B) 3·00 No. 1 Parch. Estimated.	3·00	...	2·45
Lots 8—9 inclusive sent to Curing Works as Nos. 2 and 3	4·08	...	3·28
Floats	1·89	...	1·03
Seed:			
(a) Equivalent to 5,900 lb. distributed	2·63	...	2·10
(b) Reclaimed (Estimated)	0·63	...	0·50
Samples, etc.	1·20	...	0·96
Buni	–	...	1·78
	77·37	...	64·22

Maragojipe coffee (clean) 0·20 ton.
Robusta coffee (clean) 0·40 ton.

The grading and classification of Lots 1–2, 3(A), 4–10 amounting to 56·40 tons of clean coffee was:—

GRADING	lb.	PERCENTAGE	CLASSIFICATIONS	lb.	PERCENTAGE
AA ...	29,653	23·5	1		
A ...	38,181	30·2	2		
PB ...	9,534	7·5	3... ...	22,888	18·1
B ...	23,478	18·6	4... ...	49,457	39·1
E ...	800	0·6	5... ...	19,499	15·4
AF ...	109	0·1	6... ...	754	0·6
C ...	13,068	10·3	7... ...	8,179	6·5
T ...	2,873	2·3	8... ...	2,832	2·2
TT ...	8,112	6·4	9... ...	5,967	4·7
F ...	207	0·2	10... ...	13,062	10·3
HP ...	330	0·3	11... ...	2,717	2·2
			12... ...	980	0·8
			13... ...	10	—
	126,345	100·0	...	126,345	99·9
	= 56·40			= 56·40	

61·2 was AA.s, A.s and PB.s, and 72·6% was better than class 6. Average out-turn for 1953/54 crop = 418 *debes* of cherry to a ton of parchment.

MONTHLY RAINFALL FROM SEPTEMBER, 1944 TO END OF AUGUST, 1953 IN INCHES

	September 1944 to end of August 1945	September 1945 to end of August 1946	September 1946 to end of August 1947	September 1947 to end of August 1948	September 1948 to end of August 1949	September 1949 to end of August 1950	September 1950 to end of August 1951	September 1951 to end of August 1952	September 195 to end of August 1953
September	2·42	0·20	7·34	1·23	0·30	0·33	1·87	0·24	3·29
October	3·15	0·05	4·71	1·27	2·51	0·69	0·80	2·40	0·08
November	3·10	4·66	1·13	0·93	1·65	0·26	0·88	8·65	3·53
December	5·14	0·30	2·19	1·31	6·19	1·38	0·91	4·89	0·39
January	1·72	0·02	2·01	0·46	1·79	2·06	4·19	3·63	1·54
February	1·39	1·14	0·72	0·71	4·17	3·01	2·58	1·17	0·92
March	4·85	0·57	3·37	2·72	0·10	7·09	3·20	3·06	1·24
April	15·19	16·90	28·45	14·50	9·34	16·20	20·45	11·66	15·22
May	21·34	22·74	25·73	15·56	10·64	24·96	19·38	12·65	12·51
June	3·45	2·54	10·97	2·93	0·92	5·09	7·20	3·03	2·02
July	3·15	0·59	1·43	1·53	1·86	1·81	2·09	1·38	2·02
August	1·33	1·03	1·38	0·44	0·82	0·88	1·60	0·74	2·10
Total (in inches)	66·23	50·74	89·43	43·59	40·29	63·76	65·15	53·50	44·86

Rainfall for remaining months of 1953. September 1·77. October 1·69.
November 5·35. December 1·51.